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**INTEGRATED CIRCUITS,  
FLIP-CHIP MONOLITHIC MICROCIRCUIT WITH ORGANIC SUBSTRATE,  
FULLY DEPLETED SILICON ON INSULATOR, RADIATION HARDENED,  
SYSTEM-ON-CHIP, FIELD-PROGRAMMABLE GATE ARRAY**

**BASED ON TYPE NX2H540TSC-FF1760 (NG-ULTRA)**

**ESCC Detail Specification No. 9304/012**

|         |               |
|---------|---------------|
| Issue 1 | December 2025 |
|---------|---------------|



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## 1 GENERAL

### 1.1 SCOPE

This specification details the ratings, physical and electrical characteristics and test and inspection data for the component type variants and/or the range of components specified below. It supplements the requirements of, and shall be read in conjunction with, the ESCC Generic Specification listed under Applicable Documents.

### 1.2 APPLICABLE DOCUMENTS

The following documents form part of this specification and shall be read in conjunction with it:

- (a) ESCC Generic Specification No. [9030](#).

### 1.3 TERMS, DEFINITIONS, ABBREVIATIONS, SYMBOLS AND UNITS

For the purpose of this specification, the terms, definitions, abbreviations, symbols and units specified in ESCC Basic Specification No. [21300](#) shall apply.

### 1.4 THE ESCC COMPONENT NUMBER AND COMPONENT TYPE VARIANTS

#### 1.4.1 The ESCC Component Number

The ESCC Component number shall be constituted as follows:

Example: 930401201F

- Detail Specification Reference: 9304012
- Component Type Variant Number: 01
- Total Dose Radiation Level Letter: P (as required)

#### 1.4.2 Component Type Variants

The component type variants applicable to this specification are as follows:

| Variant Number | Based on Type                          | Case                                                                  | Weight Max g | Total Dose Radiation Level Letter (Note 1, 2) |
|----------------|----------------------------------------|-----------------------------------------------------------------------|--------------|-----------------------------------------------|
| 01             | NX2H540ATSC-FF1760 (NG-ULTRA) (Note 3) | Fine pitch Flip-Chip Organic Ball Grid Array with 1760 balls (FF1760) | 42           | P [30krad(Si)]                                |
| 02             | NX2H540CTSC-FF1760 (NG-ULTRA) (Note 4) | Fine pitch Flip-Chip Organic Ball Grid Array with 1760 balls (FF1760) | 42           | P [30krad(Si)]                                |

#### NOTES:

1. The total dose radiation level letter shall be as defined in ESCC Basic Specification No. [22900](#). If an alternative radiation test level is specified in the Purchase Order the letter shall be changed accordingly.
2. The Total Dose Radiation Level Letter (P) shall be validated as follows:
  - Tested up to 50krad(Si)
3. Without High-Speed Serial Link (HSSL).
4. With High-Speed Serial Link (HSSL).

### 1.5 MAXIMUM RATINGS

The maximum ratings shall not be exceeded at any time during use or storage. Functional performance for extended periods at the maximum ratings may adversely affect device reliability.

Maximum ratings shall only be exceeded during testing to the extent specified in this specification and when stipulated in Test Methods and Procedures of the ESCC Generic Specification.

| Characteristics                                                     | Symbols                          | Maximum Ratings                               | Units | Remarks        |
|---------------------------------------------------------------------|----------------------------------|-----------------------------------------------|-------|----------------|
| Supply Voltages                                                     | VDDCORE<br>VDD_AUX<br>VDD_SWITCH | 1 $\pm$ 5%<br>1.8 $\pm$ 10%<br>1.8 $\pm$ 10%  | V     | Notes 1, 2     |
| Input/Output Voltage Range<br>Complex I/O Bank:<br>Simple I/O Bank: | VDDIO                            | 1.2; 1.5; 1.8;<br>1.8; 2.5; 3.3;<br>$\pm$ 10% | V     | Notes 1, 2     |
| Device Power Dissipation                                            | P <sub>D</sub>                   | 32                                            | W     |                |
| Operating Temperature Range                                         | T <sub>op</sub>                  | -40 to +125                                   | °C    |                |
| Storage Temperature Range                                           | T <sub>stg</sub>                 | -55 to +125                                   | °C    |                |
| Moisture Sensitivity Level                                          | MSL                              | 4                                             | -     | Ref. J-STD-020 |
| Junction Temperature                                                | T <sub>j</sub>                   | +125                                          | °C    |                |
| Soldering Temperature                                               | T <sub>sol</sub>                 | 215                                           | °C    | Note 3         |

#### NOTES:

1. See Para. 1.9.
2. With reference to V<sub>SS</sub> = 0V.
3. Time Above Liquidus (TAL): 30 seconds maximum.

### 1.6 HANDLING PRECAUTIONS

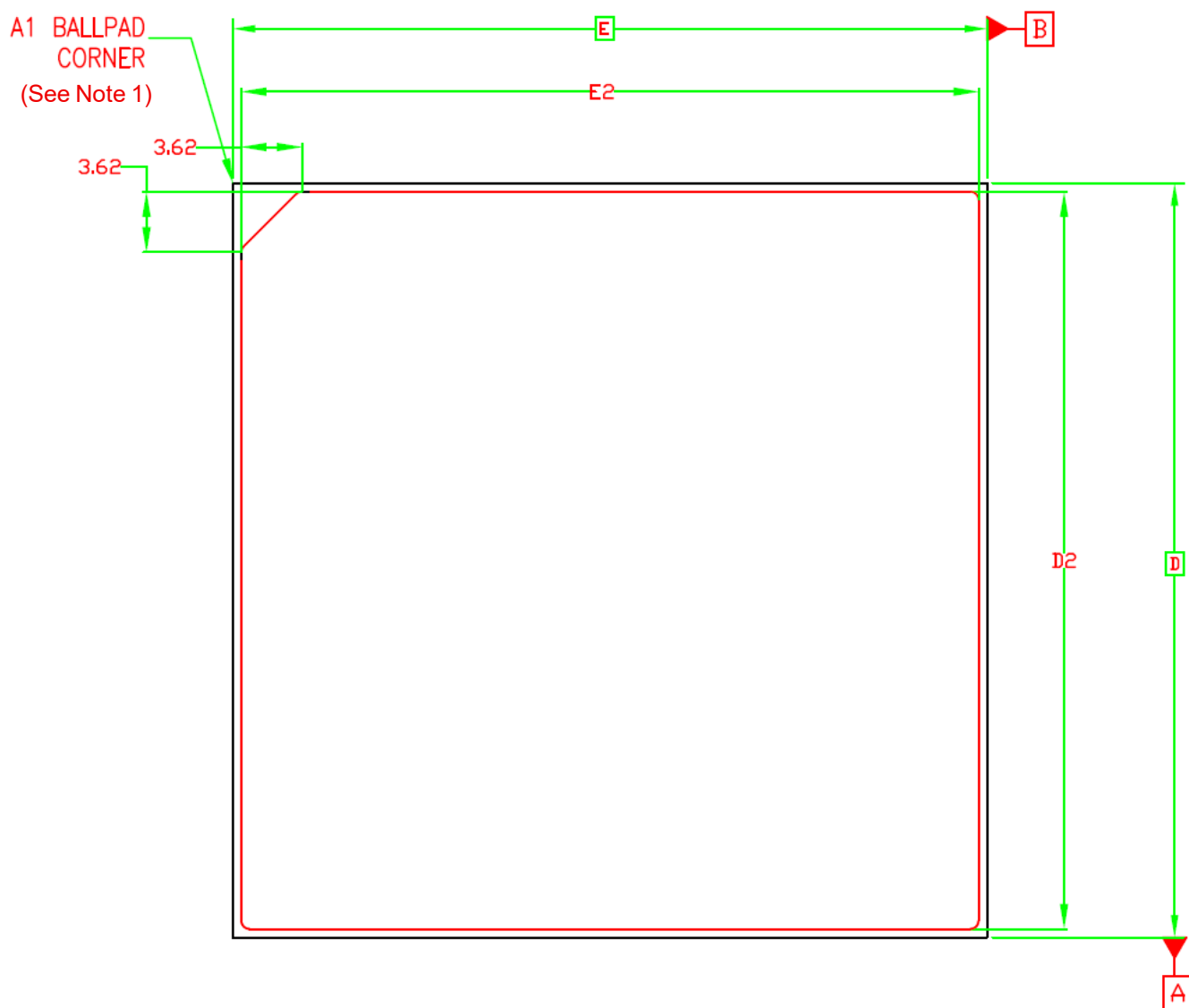
These devices are susceptible to damage by electrostatic discharge. Therefore, suitable precautions shall be employed for protection during all phases of manufacture, testing, packaging, shipment and any handling.

These components are categorised as Class 2 per ESCC Basic Specification No. [23800](#) with a Minimum Critical Path Failure Voltage of 2000 Volts.

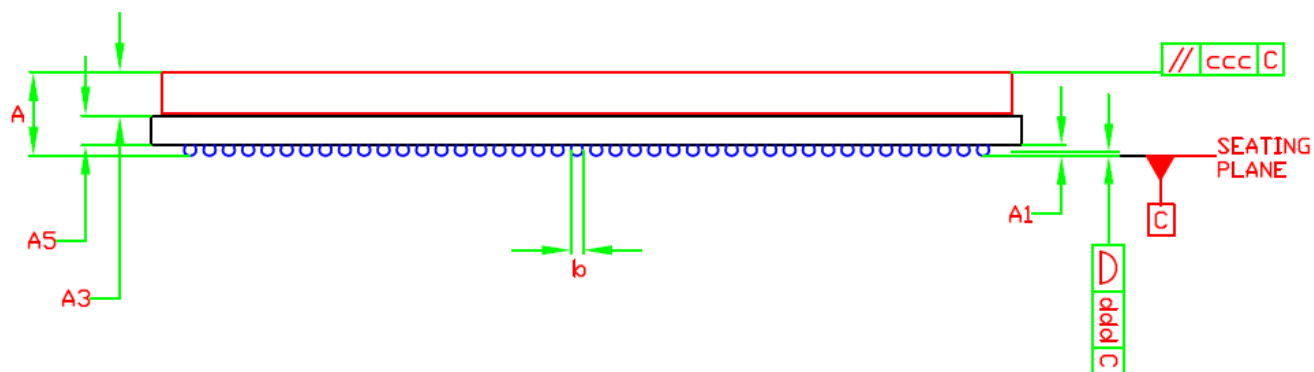
## 1.7 PHYSICAL DIMENSIONS AND TERMINAL IDENTIFICATION

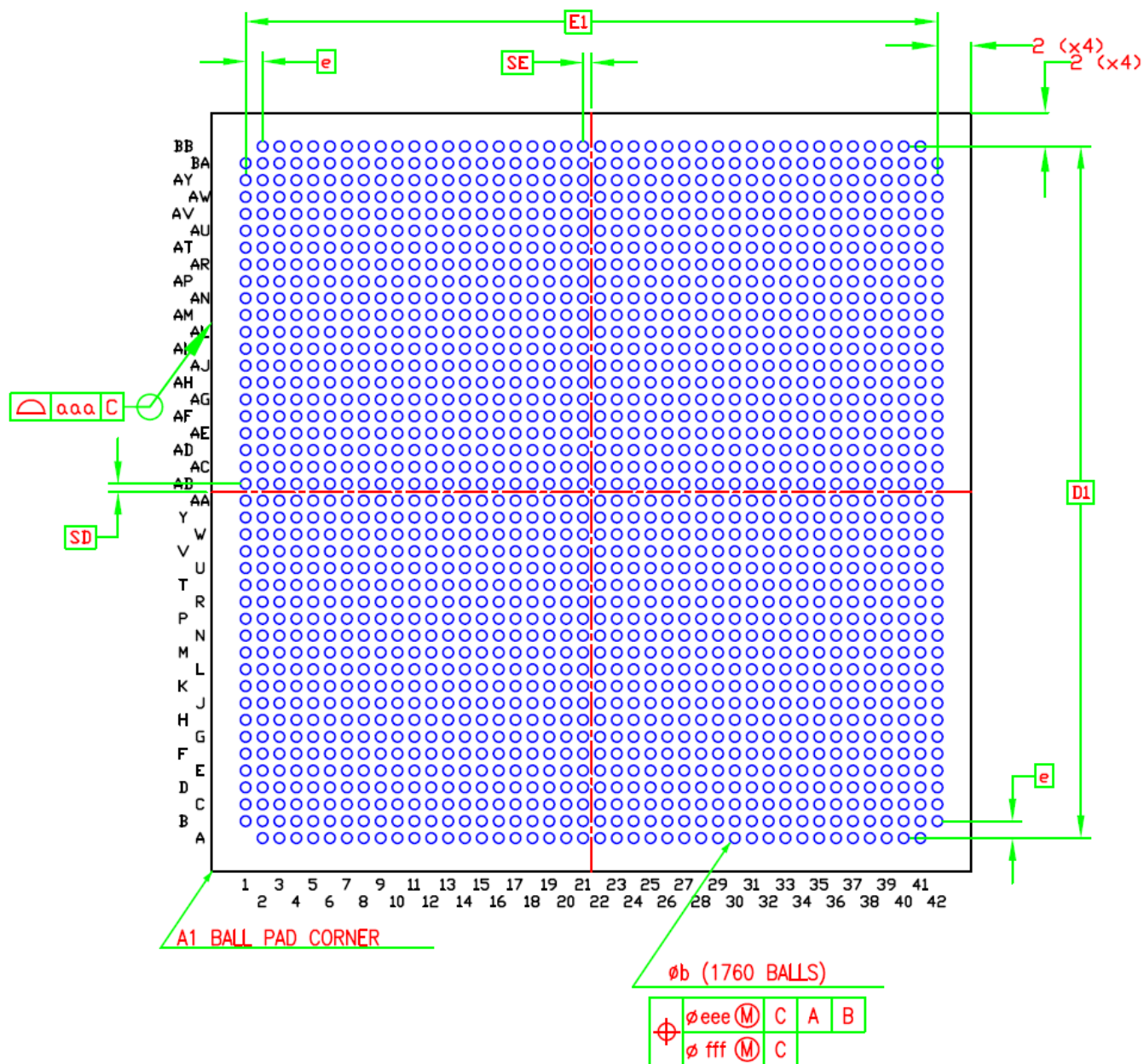
## **FINE PITCH FLIP-CHIP ORGANIC BALL GRID ARRAY WITH 1760 BALLS**

TOP VIEW



SIDE VIEW



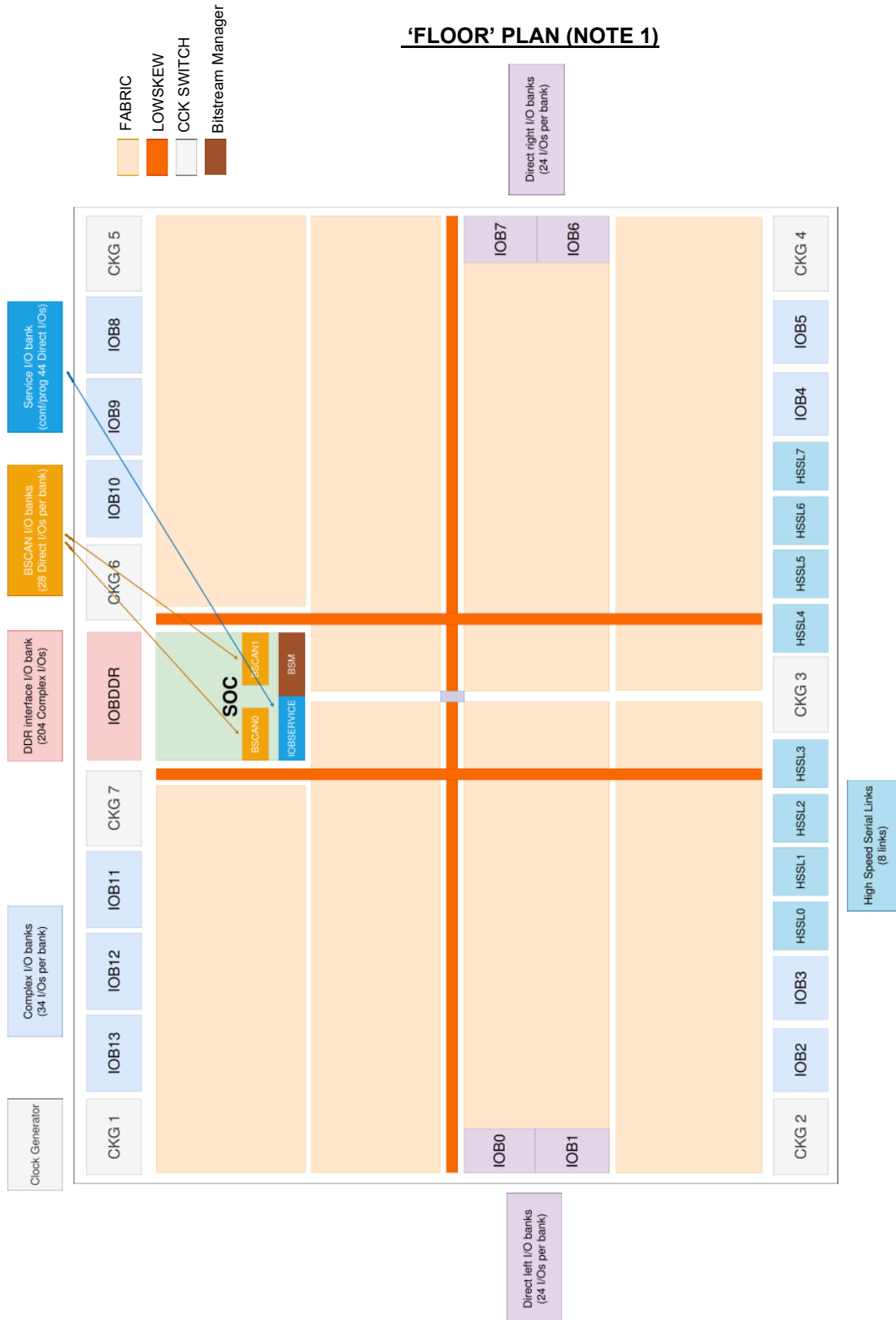


| Symbols | Dimensions mm |       | Notes |
|---------|---------------|-------|-------|
|         | Min           | Max   |       |
| A       | 4.074         | 4.514 | 2     |
| A1      | 0.42          | 0.62  |       |
| A5      | 1.354         | 1.554 |       |
| A3      | 2.11          | 2.39  | 3     |
| B       | 0.54          | 0.74  | 4     |
| D       | 45.00         |       |       |
| D1      | 41.00         |       |       |
| D2      | 43.9          | 44.10 | 3     |
| E       | 45.00         |       |       |
| E1      | 41.00         |       |       |
| E2      | 43.9          | 44.10 | 3     |
| e       | 1.00          |       |       |
| SD      | 0.50          |       |       |
| SE      | 0.50          |       |       |
| aaa     | 0.15          |       |       |
| ccc     | 0.35          |       |       |
| ddd     | 0.20          |       |       |
| eee     | 0.25          |       | 5     |
| fff     | 0.10          |       | 6     |

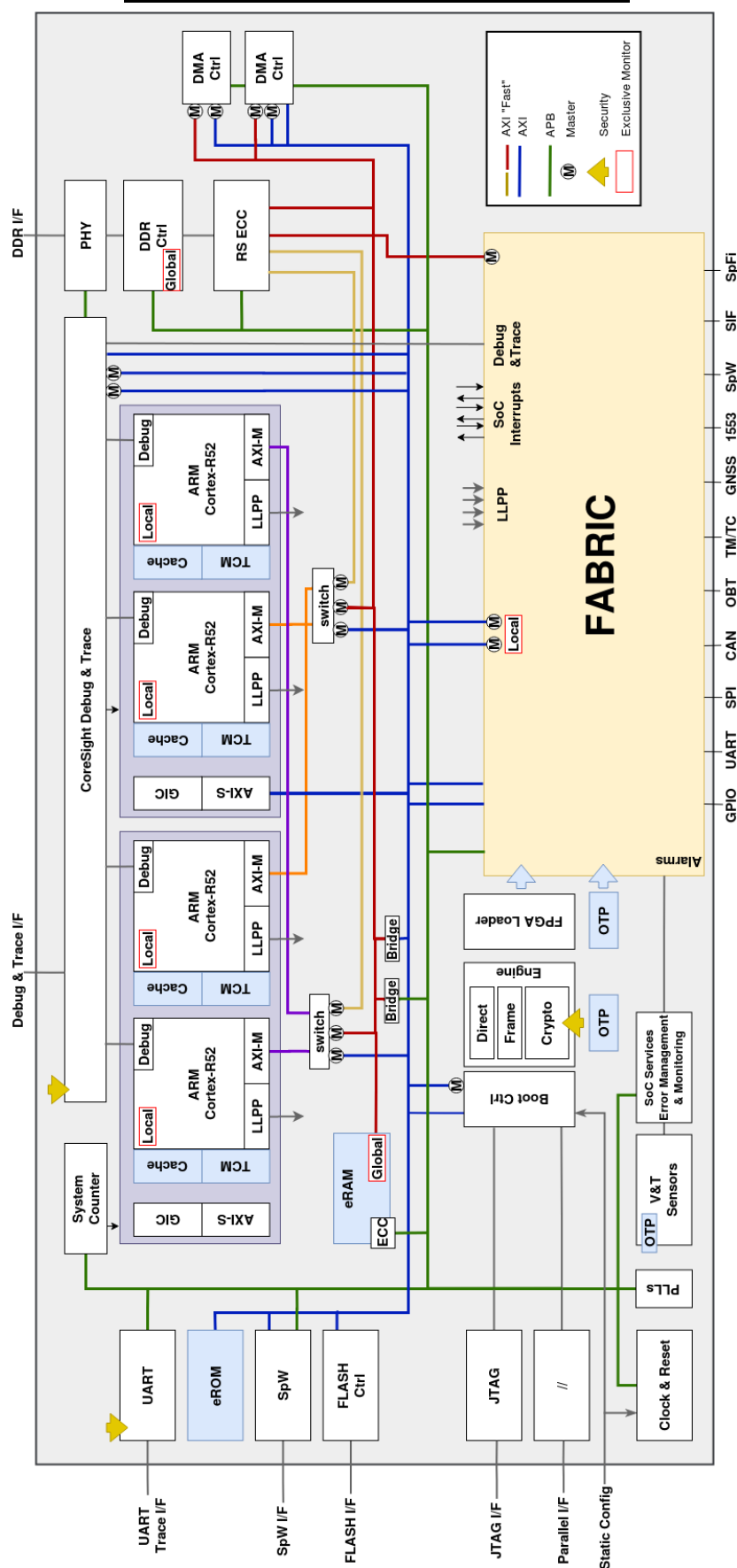
#### **NOTES:**

- Terminal identification is specified by reference to the index A1 ball/pad corner as shown. The A1 ball/pad corner shall be identified on the top surface by using a corner chamfer. The exact details of this feature are at the Manufacturer's discretion.
- The total profile height, A, is measured from the seating plane, datum C, to the top of the component.
- The metallic lid is isolated so is not connected to any terminal.
- The typical top and bottom ball diameter before mounting is 0.64mm
- The tolerance of position that controls the location of the pattern of balls with respect to datums A and B.  
For each ball there is a cylindrical tolerance zone eee perpendicular to datum C and located on true position with respect to datums A and B as defined by e. The axis perpendicular to datum C of each ball must lie within this tolerance zone.
- The tolerance of position that controls the location of the balls within the matrix with respect to each other.  
For each ball there is a cylindrical tolerance zone fff perpendicular to datum C and located on true position as defined by e. The axis perpendicular to datum C of each ball must lie within this tolerance zone.  
Each tolerance zone fff in the array is contained entirely in the respective zone eee above. The axis of each ball must lie simultaneously in both tolerance zones

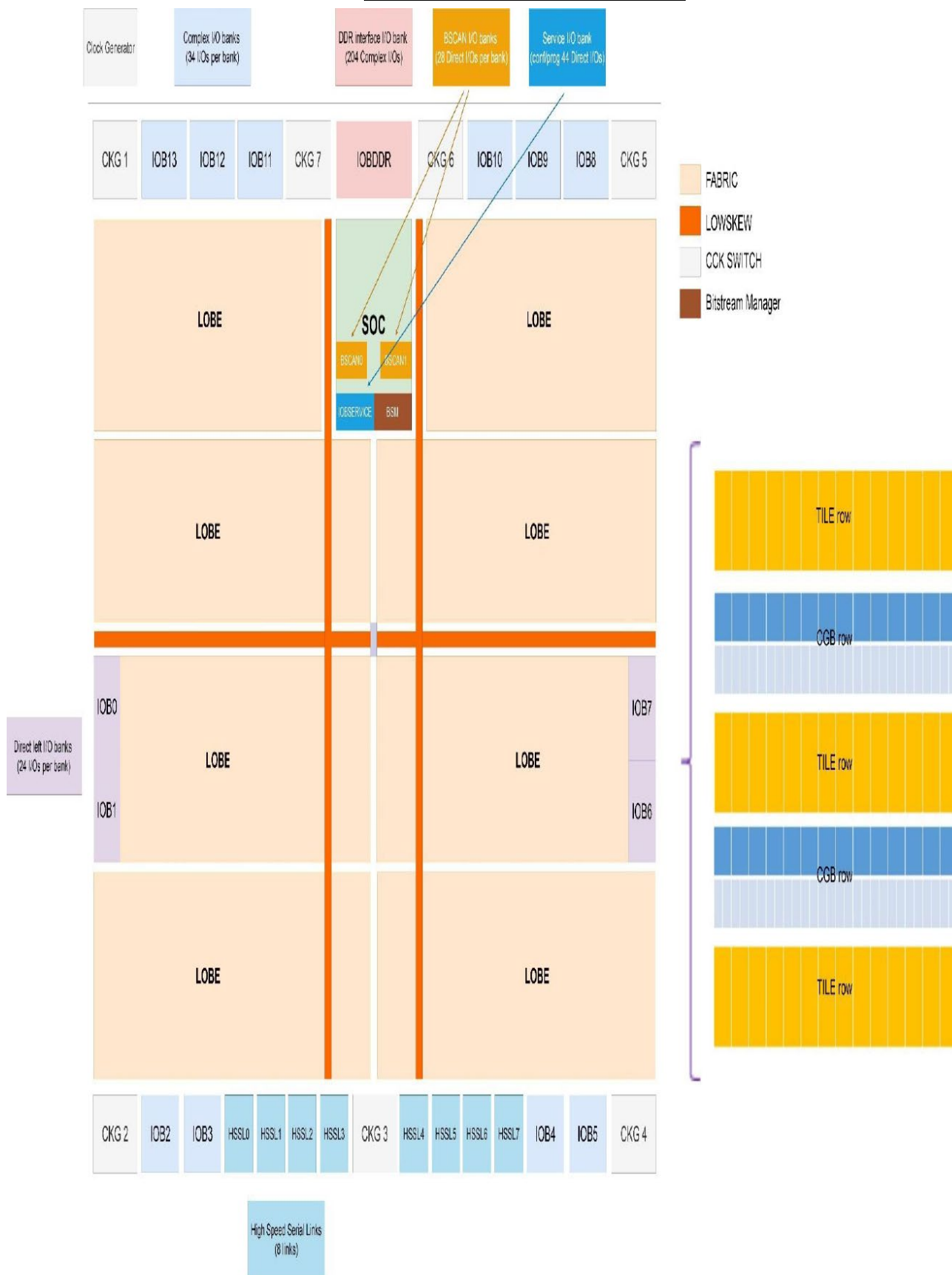
## 1.8 FUNCTIONAL DIAGRAM



## SYSTEM-ON-CHIP ARCHITECTURE (NOTE 2)



**'FABRIC' COMPOSITION (NOTE 3)**



**NOTES:**

1. The device is composed of a central fabric embedding the programmable logic, RAM and DSP blocks, and peripheral I/O buffers. The fabric is covered with a grid of High-level functional blocks interleaved with interconnect structures providing routing resources to realize the connections within the fabric and to the SoC and peripheral I/O buffers. The programmable logic resources are arranged in a hierarchical structure called a TILE and CGB with a specific local interconnect network. The I/O buffers are arranged into multiple banks. Each bank has its own I/O buffer supply voltage.

Features include:

- An I/O Ring with the following characteristics:
    - 2 Left and 2 Right Direct I/O Banks (24 I/Os per bank) IOB0, IOB1, IOB7 and IOB8
    - 10 Complex I/O Banks (34 I/Os per bank) IOB2 to IOB5 (bottom) and IOB8 to IOB13 (top)
    - 1 Service configuration I/O Bank Prog/interface (44 direct I/Os)
    - 8 HSSL (High-Speed Serial Link) blocks with each one including 4 Multi Gigabit Transceivers
  - 7 PLL clock generators CKG1, CKG2, CKG3, CKG4, CKG5, CKG6 and CKG7 (on each corner, center bottom and apart from each side of the SoC)
2. The SoC is composed of a digital processor subsystem based on a quad-core, constituted by 2 clusters of 2 ARM Cortex-R52 cores, with hard macro blocks (such as a DDR Controller with associated Reed Solomon and PHY functionalities) and also provides a set of soft macro IPs implementing peripheral I/O functions needed for satellite computers. All the soft IPs are gathered into a single configuration bitstream loaded into the programmable logic of the fabric. The Cortex-R52 core is a real-time processor based on the Armv8-R 64-bit architecture developed by ARM. The microprocessor supports DSP instructions, Neon and incorporates a Floating-Point Unit (FPU) which provides two options for calculation of operations:
    - 32 32-bit single-precision calculations
    - 32 64-bit double-precision calculations

The set of operations provided by the FPU is composed of add, subtract, divide, multiply, multiply and accumulate, square root, conversions between fixed and floating-point, and floating-point constant instructions.

Features include:

- a Quad-core ARM Cortex-R52
  - 2 BScan I/O Banks ( $2 \times 28 = 56$  direct I/Os) providing a dedicated quad SPI, a SPW and Flash interfaces
  - 1 DDR I/O Bank (204 complex I/Os) which serves as interface to connect DDR SDRAM
3. The fabric is divided into several lobes. Each lobe is made of several rows of TILE and CGB elements as shown.

Hardware capacities are composed of:

- an array of 16 rows of tiles (1316 TILE):
  - 505 344 4-input LUTs
  - 126 336 Carry Logic bits
  - 31 584 X-LUTs
  - 2 632 Register files
- an array of 8 rows of Coarse Grain Blocks (672 CGB):
  - 48 Kbit True Dual Port RAM blocks per CGB for 672 DPRAM blocks in total
  - Each CGB implements 2 DSP blocks for a total of 1344 DSP

## 1.9

PAD ASSIGNMENT

| Ball # | Pad Name         | Description                              |
|--------|------------------|------------------------------------------|
| A2     | GND              | Internal GND Plane                       |
| A3     | IO_B04_VDDIO     | Bank04 I/O Supply                        |
| A4     | IO_B04D15_P_SWDI | Complex Bank04 I/O / SpaceWire Rx Module |
| A5     | IO_B04D14_N_SWSO | Complex Bank04 I/O / SpaceWire Tx Module |
| A6     | IO_B04D14_P_SWSO | Complex Bank04 I/O / SpaceWire Tx Module |
| A7     | IO_B04D13_N_SWDO | Complex Bank04 I/O / SpaceWire Tx Module |
| A8     | IO_B04D13_P_SWDO | Complex Bank04 I/O / SpaceWire Tx Module |
| A9     | IO_B04_VDDIO     | Bank04 I/O Supply                        |
| A10    | IO_B04D02_N_SWDI | Complex Bank04 I/O / SpaceWire Rx Module |
| A11    | IO_B04D02_P_SWDI | Complex Bank04 I/O / SpaceWire Rx Module |
| A12    | IO_B04D00_N_SWDO | Complex Bank04 I/O / SpaceWire Tx Module |
| A13    | IO_B04D00_P_SWDO | Complex Bank04 I/O / SpaceWire Tx Module |
| A14    | GND              | Internal GND Plane                       |
| A15    | GND              | Internal GND Plane                       |
| A16    | IO_B05_VDDIO     | Bank05 I/O Supply                        |
| A17    | GND              | Internal GND Plane                       |
| A18    | IO_B08D01_N_SWSO | Complex Bank08 I/O / SpaceWire Tx Module |
| A19    | IO_B08D01_P_SWSO | Complex Bank08 I/O / SpaceWire Tx Module |
| A20    | IO_B08_VDDIO     | Bank08 I/O Supply                        |
| A21    | IO_B08D10_N      | Complex Bank08 I/O                       |
| A22    | IO_B08D10_P      | Complex Bank08 I/O                       |
| A23    | GND              | Internal GND Plane                       |
| A24    | IO_B08D12_N      | Complex Bank08 I/O                       |
| A25    | IO_B08D12_P      | Complex Bank08 I/O                       |
| A26    | IO_B08_VDDIO     | Bank08 I/O Supply                        |
| A27    | IO_B08_VDDIO     | Bank08 I/O Supply                        |
| A28    | IO_B10_VDDIO     | Bank10 I/O Supply                        |
| A29    | IO_B10D01_N_SWSO | Complex Bank10 I/O / SpaceWire Tx Module |
| A30    | IO_B10D01_P_SWSO | Complex Bank10 I/O / SpaceWire Tx Module |
| A31    | GND              | Internal GND Plane                       |
| A32    | IO_B10D04_N      | Complex Bank10 I/O                       |
| A33    | IO_B10D04_P      | Complex Bank10 I/O                       |
| A34    | IO_B10_VDDIO     | Bank10 I/O Supply                        |
| A35    | IO_B10D10_N      | Complex Bank10 I/O                       |
| A36    | IO_B10D10_P      | Complex Bank10 I/O                       |
| A37    | GND              | Internal GND Plane                       |
| A38    | IO_B10D12_N      | Complex Bank10 I/O                       |
| A39    | IO_B10D12_P      | Complex Bank10 I/O                       |
| A40    | IO_B10_VDDIO     | Bank10 I/O Supply                        |
| A41    | GND              | Internal GND Plane                       |
| B1     | GND              | Internal GND Plane                       |
| B2     | GND              | Internal GND Plane                       |
| B3     | IO_B04D15_N_SWDI | Complex Bank04 I/O / SpaceWire Rx Module |
| B4     | IO_B04D16_N_SWDI | Complex Bank04 I/O / SpaceWire Rx Module |

| Ball # | Pad Name           | Description                              |
|--------|--------------------|------------------------------------------|
| B5     | IO_B04D16_P_SWIS   | Complex Bank04 I/O / SpaceWire Rx Module |
| B6     | GND                | Internal GND Plane                       |
| B7     | IO_B04D07_N        | Complex Bank04 I/O                       |
| B8     | IO_B04D07_P        | Complex Bank04 I/O                       |
| B9     | IO_B04D03_N_SWIS   | Complex Bank04 I/O / SpaceWire Rx Module |
| B10    | IO_B04D03_P_SWIS   | Complex Bank04 I/O / SpaceWire Rx Module |
| B11    | GND                | Internal GND Plane                       |
| B12    | IO_B04D01_N_SWSO   | Complex Bank04 I/O / SpaceWire Tx Module |
| B13    | IO_B04D01_P_SWSO   | Complex Bank04 I/O / SpaceWire Tx Module |
| B14    | IO_B04_VDDIO       | Bank04 I/O Supply                        |
| B15    | IO_B05D16_N_SWIS   | Complex Bank05 I/O / SpaceWire Rx Module |
| B16    | IO_B05D16_P_SWIS   | Complex Bank05 I/O / SpaceWire Rx Module |
| B17    | IO_B08D00_N_SWDO   | Complex Bank08 I/O / SpaceWire Tx Module |
| B18    | IO_B08D00_P_SWDO   | Complex Bank08 I/O / SpaceWire Tx Module |
| B19    | IO_B08D04_N        | Complex Bank08 I/O                       |
| B20    | IO_B08D04_P        | Complex Bank08 I/O                       |
| B21    | IO_B08D09_N        | Complex Bank08 I/O                       |
| B22    | IO_B08D09_P_CLK    | Complex Bank08 I/O                       |
| B23    | IO_B08D11_N        | Complex Bank08 I/O                       |
| B24    | IO_B08D11_P        | Complex Bank08 I/O                       |
| B25    | IO_B08D14_N_SWSO   | Complex Bank08 I/O / SpaceWire Tx Module |
| B26    | IO_B08D14_P_SWSO   | Complex Bank08 I/O / SpaceWire Tx Module |
| B27    | IO_B08D15_P_SWDI   | Complex Bank08 I/O / SpaceWire Rx Module |
| B28    | GND                | Internal GND Plane                       |
| B29    | GND                | Internal GND Plane                       |
| B30    | IO_B10D00_N_SWDO   | Complex Bank10 I/O / SpaceWire Tx Module |
| B31    | IO_B10D00_P_SWDO   | Complex Bank10 I/O / SpaceWire Tx Module |
| B32    | IO_B10D02_N_SWDI   | Complex Bank10 I/O / SpaceWire Rx Module |
| B33    | IO_B10D02_P_SWDI   | Complex Bank10 I/O / SpaceWire Rx Module |
| B34    | IO_B10D09_N        | Complex Bank10 I/O                       |
| B35    | IO_B10D09_P_CLK    | Complex Bank10 I/O                       |
| B36    | IO_B10D11_N        | Complex Bank10 I/O                       |
| B37    | IO_B10D11_P        | Complex Bank10 I/O                       |
| B38    | IO_B10D13_N_SWDO   | Complex Bank10 I/O / SpaceWire Tx Module |
| B39    | IO_B10D13_P_SWDO   | Complex Bank10 I/O / SpaceWire Tx Module |
| B40    | IO_B10D14_P_SWSO   | Complex Bank10 I/O / SpaceWire Tx Module |
| B41    | GND                | Internal GND Plane                       |
| B42    | GND                | Internal GND Plane                       |
| C1     | GND                | Internal GND Plane                       |
| C2     | CKGEN3_PLL_VDD1V8A | CKGEN3 PLL 1.8V Analog Supply            |
| C3     | IO_B04D12_N        | Complex Bank04 I/O                       |
| C4     | IO_B04D12_P        | Complex Bank04 I/O                       |
| C5     | IO_B04D10_N        | Complex Bank04 I/O                       |
| C6     | IO_B04D10_P        | Complex Bank04 I/O                       |

| Ball # | Pad Name           | Description                              |
|--------|--------------------|------------------------------------------|
| C7     | IO_B04D08_N        | Complex Bank04 I/O                       |
| C8     | IO_B04D08_P_CLK    | Complex Bank04 I/O                       |
| C9     | IO_B04D06_N        | Complex Bank04 I/O                       |
| C10    | IO_B04D05_N        | Complex Bank04 I/O                       |
| C11    | IO_B04D05_P        | Complex Bank04 I/O                       |
| C12    | IO_B04D04_N        | Complex Bank04 I/O                       |
| C13    | IO_B04D04_P        | Complex Bank04 I/O                       |
| C14    | IO_B04_VDDS        | Bank04 Termination Switch Supply         |
| C15    | IO_B05D15_N_SWDI   | Complex Bank05 I/O / SpaceWire Rx Module |
| C16    | IO_B05D15_P_SWDI   | Complex Bank05 I/O / SpaceWire Rx Module |
| C17    | IO_B08_VDDIO       | Bank08 I/O Supply                        |
| C18    | IO_B08D02_N_SWDI   | Complex Bank08 I/O / SpaceWire Rx Module |
| C19    | IO_B08D02_P_SWDI   | Complex Bank08 I/O / SpaceWire Rx Module |
| C20    | GND                | Internal GND Plane                       |
| C21    | IO_B08D07_N        | Complex Bank08 I/O                       |
| C22    | IO_B08D07_P        | Complex Bank08 I/O                       |
| C23    | IO_B08_VDDIO       | Bank08 I/O Supply                        |
| C24    | IO_B08D13_N_SWDO   | Complex Bank08 I/O                       |
| C25    | IO_B08D13_P_SWDO   | Complex Bank08 I/O                       |
| C26    | IO_B08D15_N_SWDI   | Complex Bank08 I/O                       |
| C27    | IO_B08D16_P_SWSI   | Complex Bank08 I/O                       |
| C28    | IO_B08_VTO         | Bank08 Termination Voltage               |
| C29    | IO_B10_VTO         | Bank10 Termination Voltage               |
| C30    | IO_B10_VTO         | Bank10 Termination Voltage               |
| C31    | IO_B08_VDDS        | Bank08 Termination Switch Supply         |
| C32    | IO_B10D03_N_SWSI   | Complex Bank10 I/O / SpaceWire Rx Module |
| C33    | IO_B10D03_P_SWSI   | Complex Bank10 I/O / SpaceWire Rx Module |
| C34    | GND                | Internal GND Plane                       |
| C35    | IO_B10D07_N        | Complex Bank10 I/O                       |
| C36    | IO_B10D07_P        | Complex Bank10 I/O                       |
| C37    | IO_B10_VDDIO       | Bank10 I/O Supply                        |
| C38    | IO_B10D15_P_SWDI   | Complex Bank10 I/O / SpaceWire Rx Module |
| C39    | IO_B10D14_N_SWSO   | Complex Bank10 I/O / SpaceWire Tx Module |
| C40    | GND                | Internal GND Plane                       |
| C41    | CKGEN4_PLL_VDD1V8A | CKGEN4 PLL 1.8V Analog Supply            |
| C42    | GND                | Internal GND Plane                       |
| D1     | CKGEN3_PLL_VDD1V8A | CKGEN3 PLL 1.8V Analog Supply            |
| D2     | CKGEN3_PLL_VDDA    | CKGEN3 PLL 1V Analog Supply              |
| D3     | GND                | Internal GND Plane                       |
| D4     | IO_B04D11_N        | Complex Bank04 I/O                       |
| D5     | IO_B04D11_P        | Complex Bank04 I/O                       |
| D6     | IO_B04_VDDIO       | Bank04 I/O Supply                        |
| D7     | IO_B04D09_N        | Complex Bank04 I/O                       |
| D8     | IO_B04D09_P_CLK    | Complex Bank04 I/O                       |

| Ball # | Pad Name           | Description                              |
|--------|--------------------|------------------------------------------|
| D9     | GND                | Internal GND Plane                       |
| D10    | IO_B04D06_P        | Complex Bank04 I/O                       |
| D11    | IO_B04_VDDIO       | Bank04 I/O Supply                        |
| D12    | IO_B04_VTO         | Bank04 Termination Voltage               |
| D13    | IO_B04_VTO         | Bank04 Termination Voltage               |
| D14    | IO_B04_VTO         | Bank04 Termination Voltage               |
| D15    | IO_B05_VDDS        | Bank05 Termination Switch Supply         |
| D16    | GND                | Internal GND Plane                       |
| D17    | IO_B08D03_N_SWIS   | Complex Bank08 I/O / SpaceWire Rx Module |
| D18    | IO_B08D03_P_SWIS   | Complex Bank08 I/O / SpaceWire Rx Module |
| D19    | IO_B08D05_N        | Complex Bank08 I/O                       |
| D20    | IO_B08D05_P        | Complex Bank08 I/O                       |
| D21    | IO_B08D06_N        | Complex Bank08 I/O                       |
| D22    | IO_B08D06_P        | Complex Bank08 I/O                       |
| D23    | IO_B08D08_N        | Complex Bank08 I/O                       |
| D24    | IO_B08D08_P_CLK    | Complex Bank08 I/O                       |
| D25    | GND                | Internal GND Plane                       |
| D26    | IO_B08D16_N_SWIS   | Complex Bank08 I/O / SpaceWire Rx Module |
| D27    | IO_B09D01_P_SWIS   | Complex Bank08 I/O / SpaceWire Tx Module |
| D28    | IO_B08_VTO         | Bank08 Termination Voltage               |
| D29    | IO_B10_VTO         | Bank10 Termination Voltage               |
| D30    | IO_B09_VTO         | Bank09 Termination Voltage               |
| D31    | IO_B10_VDDS        | Bank10 Termination Switch Supply         |
| D32    | IO_B10_VDDIO       | Bank10 I/O Supply                        |
| D33    | IO_B10D05_N        | Complex Bank10 I/O                       |
| D34    | IO_B10D05_P        | Complex Bank10 I/O                       |
| D35    | IO_B10D06_N        | Complex Bank10 I/O                       |
| D36    | IO_B10D06_P        | Complex Bank10 I/O                       |
| D37    | IO_B10D08_P_CLK    | Complex Bank10 I/O                       |
| D38    | IO_B10D15_N_SWIS   | Complex Bank10 I/O / SpaceWire Rx Module |
| D39    | IO_B10D16_N_SWIS   | Complex Bank10 I/O / SpaceWire Rx Module |
| D40    | IO_B10D16_P_SWIS   | Complex Bank10 I/O / SpaceWire Rx Module |
| D41    | CKGEN4_PLL_VDDA    | CKGEN4 PLL 1V Analog Supply              |
| D42    | CKGEN4_PLL_VDD1V8A | CKGEN4 PLL 1.8V Analog Supply            |
| E1     | GND                | Internal GND Plane                       |
| E2     | GND                | Internal GND Plane                       |
| E3     | GND                | Internal GND Plane                       |
| E4     | GND                | Internal GND Plane                       |
| E5     | GND                | Internal GND Plane                       |
| E6     | GND                | Internal GND Plane                       |
| E7     | GND                | Internal GND Plane                       |
| E8     | GND                | Internal GND Plane                       |
| E9     | GND                | Internal GND Plane                       |
| E10    | GND                | Internal GND Plane                       |

| Ball # | Pad Name          | Description                                |
|--------|-------------------|--------------------------------------------|
| E11    | GND               | Internal GND Plane                         |
| E12    | IO_B05_VTO        | Bank05 Termination Voltage                 |
| E13    | IO_B05_VTO        | Bank05 Termination Voltage                 |
| E14    | IO_B05_VTO        | Bank05 Termination Voltage                 |
| E15    | IO_B05_VDDIO      | Bank05 I/O Supply                          |
| E16    | IO_B05D14_P_SWSO  | Complex Bank05 I/O / SpaceWire Tx Module   |
| E17    | IO_B06_VDDIO      | Bank06 I/O Supply                          |
| E18    | IO_B06D01         | Direct Bank06 I/O                          |
| E19    | GND               | Internal GND Plane                         |
| E20    | IO_B06D08         | Direct Bank06 I/O                          |
| E21    | IO_B06D09         | Direct Bank06 I/O                          |
| E22    | IO_B06_VDDIO      | Bank06 I/O Supply                          |
| E23    | IO_B06D23         | Direct Bank06 I/O                          |
| E24    | GND               | Internal GND Plane                         |
| E25    | GND               | Internal GND Plane                         |
| E26    | IO_B09D01_N_SWSO  | Complex Bank09 I/O / SpaceWire Tx Module   |
| E27    | IO_B09D04_N       | Complex Bank09 I/O                         |
| E28    | IO_B08_VTO        | Bank08 Termination Voltage                 |
| E29    | IO_B09_VTO        | Bank09 Termination Voltage                 |
| E30    | IO_B09_VTO        | Bank09 Termination Voltage                 |
| E31    | IO_B09_VDDS       | Bank09 Termination Switch Supply           |
| E32    | IO_B09D11_N       | Complex Bank09 I/O                         |
| E33    | IO_B09D11_P       | Complex Bank09 I/O                         |
| E34    | IO_B09D12_N       | Complex Bank09 I/O                         |
| E35    | IO_B09D12_P       | Complex Bank09 I/O                         |
| E36    | IO_B10D08_N       | Complex Bank09 I/O                         |
| E37    | SOC_DDR_VDDIO     | SOC DDR I/O Bank 1.2V, 1.5V or 1.8V Supply |
| E38    | SOC_DDR_VDDIO     | SOC DDR I/O Bank 1.2V, 1.5V or 1.8V Supply |
| E39    | SOC_DDR_DQ102     | SOC DDR                                    |
| E40    | SOC_DDR_DQ103     | SOC DDR                                    |
| E41    | GND               | Internal GND Plane                         |
| E42    | SOC_DDR_DQ104_RST | SOC DDR                                    |
| F1     | HSSL7_TX3_N       | HSSL7 TX3 Channel                          |
| F2     | HSSL7_TX3_P       | HSSL7 TX3 Channel                          |
| F3     | GND               | Internal GND Plane                         |
| F4     | HSSL7_VDDA        | HSSL7 TX Driver 1.0V Analog Supply         |
| F5     | HSSL7_RX3_N       | HSSL7 RX3 Channel                          |
| F6     | HSSL7_RX3_P       | HSSL7 RX3 Channel                          |
| F7     | GND               | Internal GND Plane                         |
| F8     | HSSL7_VDD1V8A     | HSSL7 RX/TX 1.8V Analog Supply             |
| F9     | GND               | Internal GND Plane                         |
| F10    | HSSL7_D_VDD       | HSSL7 1.0V Digital Supply                  |
| F11    | GND               | Internal GND Plane                         |
| F12    | IO_B05D03_N_SWSI  | Complex Bank05 I/O / SpaceWire Rx Module   |

| Ball # | Pad Name          | Description                              |
|--------|-------------------|------------------------------------------|
| F13    | IO_B05D03_P_SWI   | Complex Bank05 I/O / SpaceWire Rx Module |
| F14    | IO_B05D02_P_SWDI  | Complex Bank05 I/O / SpaceWire Rx Module |
| F15    | IO_B05D13_P_SWDO  | Complex Bank05 I/O / SpaceWire Tx Module |
| F16    | IO_B05D14_N_SWSO  | Complex Bank05 I/O / SpaceWire Tx Module |
| F17    | IO_B06D00         | Direct Bank06 I/O                        |
| F18    | IO_B06D02         | Direct Bank06 I/O                        |
| F19    | IO_B06D03         | Direct Bank06 I/O                        |
| F20    | IO_B06D10         | Direct Bank06 I/O                        |
| F21    | IO_B06D11         | Direct Bank06 I/O                        |
| F22    | IO_B06D20         | Direct Bank06 I/O                        |
| F23    | IO_B06D21         | Direct Bank06 I/O                        |
| F24    | IO_B06D22         | Direct Bank06 I/O                        |
| F25    | IO_B09D00_N_SWDO  | Complex Bank09 I/O / SpaceWire Tx Module |
| F26    | IO_B09D00_P_SWDO  | Complex Bank09 I/O / SpaceWire Tx Module |
| F27    | IO_B09_VDDIO      | Bank09 I/O Supply                        |
| F28    | IO_B09D04_P       | Complex Bank09 I/O                       |
| F29    | IO_B09D07_N       | Complex Bank09 I/O                       |
| F30    | GND               | Internal GND Plane                       |
| F31    | IO_B09D10_N       | Complex Bank09 I/O                       |
| F32    | IO_B09D10_P       | Complex Bank09 I/O                       |
| F33    | IO_B09_VDDIO      | Bank09 I/O Supply                        |
| F34    | IO_B09D15_N_SWDI  | Complex Bank09 I/O / SpaceWire Rx Module |
| F35    | IO_B09D14_N_SWSO  | Complex Bank09 I/O / SpaceWire Tx Module |
| F36    | GND               | Internal GND Plane                       |
| F37    | SOC_DDR_DQSN12    | SOC DDR                                  |
| F38    | SOC_DDR_DQSP12    | SOC DDR                                  |
| F39    | SOC_DDR_DQ101     | SOC DDR                                  |
| F40    | SOC_DDR_DQ100     | SOC DDR                                  |
| F41    | SOC_DDR_DQ107_WEN | SOC DDR                                  |
| F42    | SOC_DDR_DQ105_ODT | SOC DDR                                  |
| G1     | GND               | Internal GND Plane                       |
| G2     | GND               | Internal GND Plane                       |
| G3     | HSSL7_TX2_N       | HSSL7 TX2 Channel                        |
| G4     | HSSL7_TX2_P       | HSSL7 TX2 Channel                        |
| G5     | GND               | Internal GND Plane                       |
| G6     | GND               | Internal GND Plane                       |
| G7     | HSSL7_RX2_N       | HSSL7 RX2 Channel                        |
| G8     | HSSL7_RX2_P       | HSSL7 RX2 Channel                        |
| G9     | HSSL7_CKREF_P     | HSSL7 Differential Reference Clock       |
| G10    | HSSL7_D_VDD       | HSSL7 1.0V Digital Supply                |
| G11    | GND               | Internal GND Plane                       |
| G12    | IO_B05D01_P_SWSO  | Complex Bank05 I/O / SpaceWire Tx Module |
| G13    | GND               | Internal GND Plane                       |
| G14    | IO_B05D02_N_SWDI  | Complex Bank05 I/O / SpaceWire Rx Module |

| Ball # | Pad Name          | Description                              |
|--------|-------------------|------------------------------------------|
| G15    | IO_B05D13_N_SWDO  | Complex Bank05 I/O / SpaceWire Tx Module |
| G16    | IO_B05_VDDIO      | Bank05 I/O Supply                        |
| G17    | GND               | Internal GND Plane                       |
| G18    | IO_B06D04         | Direct Bank06 I/O                        |
| G19    | IO_B06D05         | Direct Bank06 I/O                        |
| G20    | IO_B06D12         | Direct Bank06 I/O                        |
| G21    | IO_B06D13         | Direct Bank06 I/O                        |
| G22    | GND               | Internal GND Plane                       |
| G23    | IO_B06D18         | Direct Bank06 I/O                        |
| G24    | IO_B06D19         | Direct Bank06 I/O                        |
| G25    | IO_B09D02_N_SWDI  | Complex Bank09 I/O / SpaceWire Rx Module |
| G26    | IO_B09D02_P_SWDI  | Complex Bank09 I/O / SpaceWire Rx Module |
| G27    | IO_B09D03_P_SWSI  | Complex Bank09 I/O / SpaceWire Rx Module |
| G28    | IO_B09D06_N       | Complex Bank09 I/O                       |
| G29    | IO_B09D06_P       | Complex Bank09 I/O                       |
| G30    | IO_B09D07_P       | Complex Bank09 I/O                       |
| G31    | IO_B09D09_N       | Complex Bank09 I/O                       |
| G32    | IO_B09D09_P_CLK   | Complex Bank09 I/O                       |
| G33    | IO_B09D13_N_SWDO  | Complex Bank09 I/O / SpaceWire Tx Module |
| G34    | IO_B09D13_P_SWDO  | Complex Bank09 I/O / SpaceWire Tx Module |
| G35    | IO_B09D15_P_SWDI  | Complex Bank09 I/O / SpaceWire Rx Module |
| G36    | IO_B09D14_P_SWSO  | Complex Bank09 I/O / SpaceWire Tx Module |
| G37    | SOC_DDR_DM12      | SOC DDR                                  |
| G38    | SOC_DDR_DQ97      | SOC DDR                                  |
| G39    | SOC_DDR_DQ98      | SOC DDR                                  |
| G40    | SOC_DDR_DQ99      | SOC DDR                                  |
| G41    | SOC_DDR_DQ108_BA0 | SOC DDR                                  |
| G42    | SOC_DDR_DQ109_A6  | SOC DDR                                  |
| H1     | HSSL7_TX1_N       | HSSL7 TX1 Channel                        |
| H2     | HSSL7_TX1_P       | HSSL7 TX1 Channel                        |
| H3     | GND               | Internal GND Plane                       |
| H4     | HSSL7_VDDA        | HSSL7 TX Driver 1.0V Analog Supply       |
| H5     | HSSL7_RX1_N       | HSSL7 RX1 Channel                        |
| H6     | HSSL7_RX1_P       | HSSL7 RX1 Channel                        |
| H7     | GND               | Internal GND Plane                       |
| H8     | HSSL7_VDD1V8A     | HSSL7 RX/TX 1.8V Analog Supply           |
| H9     | HSSL7_CKREF_N     | HSSL7 Differential Reference Clock       |
| H10    | HSSL7_D_VDD       | HSSL7 1.0V Digital Supply                |
| H11    | GND               | Internal GND Plane                       |
| H12    | IO_B05D01_N_SWSO  | Complex Bank05 I/O / SpaceWire Tx Module |
| H13    | IO_B05D00_N_SWDO  | Complex Bank05 I/O / SpaceWire Tx Module |
| H14    | IO_B05D00_P_SWDO  | Complex Bank05 I/O / SpaceWire Tx Module |
| H15    | IO_B05D12_N       | Complex Bank05 I/O                       |
| H16    | IO_B05D12_P       | Complex Bank05 I/O                       |

| Ball # | Pad Name         | Description                                |
|--------|------------------|--------------------------------------------|
| H17    | IO_B06D06        | Direct Bank06 I/O                          |
| H18    | IO_B06D07        | Direct Bank06 I/O                          |
| H19    | IO_B06_VDDIO     | Bank06 I/O Supply                          |
| H20    | IO_B06D14        | Direct Bank06 I/O                          |
| H21    | IO_B06D15        | Direct Bank06 I/O                          |
| H22    | IO_B06D16        | Direct Bank06 I/O                          |
| H23    | IO_B06D17        | Direct Bank06 I/O                          |
| H24    | IO_B06_VDDIO     | Bank06 I/O Supply                          |
| H25    | IO_B09_VDDIO     | Bank09 I/O Supply                          |
| H26    | IO_B09D03_N_SWIS | Complex Bank09 I/O / SpaceWire Rx Module   |
| H27    | GND              | Internal GND Plane                         |
| H28    | IO_B09D05_N      | Complex Bank09 I/O                         |
| H29    | IO_B09D05_P      | Complex Bank09 I/O                         |
| H30    | IO_B09_VDDIO     | Bank09 I/O Supply                          |
| H31    | IO_B09D08_N      | Complex Bank09 I/O                         |
| H32    | IO_B09D08_P_CLK  | Complex Bank09 I/O                         |
| H33    | GND              | Internal GND Plane                         |
| H34    | IO_B09D16_N_SWIS | Complex Bank09 I/O / SpaceWire Rx Module   |
| H35    | IO_B09D16_P_SWIS | Complex Bank09 I/O / SpaceWire Rx Module   |
| H36    | IO_B09_VDDIO     | Bank09 I/O Supply                          |
| H37    | GND              | Internal GND Plane                         |
| H38    | GND              | Internal GND Plane                         |
| H39    | SOC_DDR_DQ96     | SOC DDR                                    |
| H40    | SOC_DDR_DQ95     | SOC DDR                                    |
| H41    | SOC_DDR_VDDIO    | SOC DDR I/O Bank 1.2V, 1.5V or 1.8V Supply |
| H42    | SOC_DDR_DQ110_A8 | SOC DDR                                    |
| J1     | GND              | Internal GND Plane                         |
| J2     | GND              | Internal GND Plane                         |
| J3     | HSSL7_TX0_N      | HSSL7 TX0 Channel                          |
| J4     | HSSL7_TX0_P      | HSSL7 TX0 Channel                          |
| J5     | GND              | Internal GND Plane                         |
| J6     | GND              | Internal GND Plane                         |
| J7     | HSSL7_RX0_N      | HSSL7 RX0 Channel                          |
| J8     | HSSL7_RX0_P      | HSSL7 RX0 Channel                          |
| J9     | GND              | Internal GND Plane                         |
| J10    | HSSL7_CALIBRATE  | HSSL7 TX/RX Termination Calibration        |
| J11    | GND              | Internal GND Plane                         |
| J12    | IO_B05D08_P_CLK  | Complex Bank05 I/O                         |
| J13    | IO_B05D09_N      | Complex Bank05 I/O                         |
| J14    | IO_B05D09_P_CLK  | Complex Bank05 I/O                         |
| J15    | IO_B05D10_P      | Complex Bank05 I/O                         |
| J16    | IO_B05D11_P      | Complex Bank05 I/O                         |
| J17    | IO_B07_VDDIO     | Bank07 I/O Supply                          |
| J18    | IO_B07D01        | Direct Bank07 I/O                          |

| Ball # | Pad Name            | Description                        |
|--------|---------------------|------------------------------------|
| J19    | GND                 | Internal GND Plane                 |
| J20    | IO_B07D08           | Direct Bank07 I/O                  |
| J21    | IO_B07D09           | Direct Bank07 I/O                  |
| J22    | IO_B07_VDDIO        | Bank07 I/O Supply                  |
| J23    | IO_B07D23           | Direct Bank07 I/O                  |
| J24    | GND                 | Internal GND Plane                 |
| J25    | SOC_BSCAN_SPI1_CS_N | SOC SPI                            |
| J26    | SOC_BSCAN_SPI1_IO0  | SOC SPI                            |
| J27    | SOC_BSCAN_SPI1_IO1  | SOC SPI                            |
| J28    | SOC_BSCAN_SPI1_IO2  | SOC SPI                            |
| J29    | SOC_BSCAN_SPI1_IO3  | SOC SPI                            |
| J30    | SOC_BSCAN_VDDIO     | SOC I/O Bank 3.3V Supply           |
| J31    | SOC_BSCAN_SPI1_SCLK | SOC SPI                            |
| J32    | SOC_BSCAN_SIN       | SOC SPACEWIRE                      |
| J33    | SOC_BSCAN_SOUT      | SOC SPACEWIRE                      |
| J34    | GND                 | Internal GND Plane                 |
| J35    | GND                 | Internal GND Plane                 |
| J36    | SOC_DDR_DM11        | SOC DDR                            |
| J37    | SOC_DDR_DQSN11      | SOC DDR                            |
| J38    | SOC_DDR_DQSP11      | SOC DDR                            |
| J39    | SOC_DDR_DQ93        | SOC DDR                            |
| J40    | SOC_DDR_DQ94        | SOC DDR                            |
| J41    | SOC_DDR_DQ111_A11   | SOC DDR                            |
| J42    | SOC_DDR_DM14_A2     | SOC DDR                            |
| K1     | HSSL6_TX3_N         | HSSL6 TX3 Channel                  |
| K2     | HSSL6_TX3_P         | HSSL6 TX3 Channel                  |
| K3     | GND                 | Internal GND Plane                 |
| K4     | HSSL6_VDDA          | HSSL6 TX Driver 1.0V Analog Supply |
| K5     | HSSL6_RX3_N         | HSSL6 RX3 Channel                  |
| K6     | HSSL6_RX3_P         | HSSL6 RX3 Channel                  |
| K7     | GND                 | Internal GND Plane                 |
| K8     | HSSL6_VDD1V8A       | HSSL6 RX/TX 1.8V Analog Supply     |
| K9     | GND                 | Internal GND Plane                 |
| K10    | HSSL6_D_VDD         | HSSL6 1.0V Digital Supply          |
| K11    | GND                 | Internal GND Plane                 |
| K12    | IO_B05D08_N         | Complex Bank05 I/O                 |
| K13    | IO_B05_VDDIO        | Bank05 I/O Supply                  |
| K14    | IO_B05D10_N         | Complex Bank05 I/O                 |
| K15    | IO_B05D11_N         | Complex Bank05 I/O                 |
| K16    | GND                 | Internal GND Plane                 |
| K17    | IO_B07D00           | Direct Bank07 I/O                  |
| K18    | IO_B07D02           | Direct Bank07 I/O                  |
| K19    | IO_B07D03           | Direct Bank07 I/O                  |
| K20    | IO_B07D10           | Direct Bank07 I/O                  |

| Ball # | Pad Name              | Description                        |
|--------|-----------------------|------------------------------------|
| K21    | IO_B07D11             | Direct Bank07 I/O                  |
| K22    | IO_B07D20             | Direct Bank07 I/O                  |
| K23    | IO_B07D21             | Direct Bank07 I/O                  |
| K24    | IO_B07D22             | Direct Bank07 I/O                  |
| K25    | SOC_BSCAN_SPI2_CS_N   | SOC SPI                            |
| K26    | SOC_BSCAN_SPI2_IO0    | SOC SPI                            |
| K27    | SOC_BSCAN_SPI2_IO1    | SOC SPI                            |
| K28    | SOC_BSCAN_SPI2_IO2    | SOC SPI                            |
| K29    | SOC_BSCAN_SPI2_IO3    | SOC SPI                            |
| K30    | SOC_BSCAN_SPI2_SCLK   | SOC SPI                            |
| K31    | SOC_BSCAN_SPI_RESET_N | SOC SPI                            |
| K32    | SOC_BSCAN_DIN         | SOC SPACEWIRE                      |
| K33    | SOC_BSCAN_DOUT        | SOC SPACEWIRE                      |
| K34    | CKGEN5_PLL_VDD1V8A    | CKGEN5 PLL 1.8V Analog Supply      |
| K35    | GND                   | Internal GND Plane                 |
| K36    | SOC_DDR_DQ90          | SOC DDR                            |
| K37    | SOC_DDR_DQ88          | SOC DDR                            |
| K38    | SOC_DDR_DQ87          | SOC DDR                            |
| K39    | SOC_DDR_DQ91          | SOC DDR                            |
| K40    | SOC_DDR_DQ92          | SOC DDR                            |
| K41    | SOC_DDR_DQ112_ACT     | SOC DDR                            |
| K42    | SOC_DDR_DQSN13_CKN    | SOC DDR                            |
| L1     | GND                   | Internal GND Plane                 |
| L2     | GND                   | Internal GND Plane                 |
| L3     | HSSL6_TX2_N           | HSSL6 TX2 Channel                  |
| L4     | HSSL6_TX2_P           | HSSL6 TX2 Channel                  |
| L5     | GND                   | Internal GND Plane                 |
| L6     | GND                   | Internal GND Plane                 |
| L7     | HSSL6_RX2_N           | HSSL6 RX2 Channel                  |
| L8     | HSSL6_RX2_P           | HSSL6 RX2 Channel                  |
| L9     | HSSL6_CKREF_P         | HSSL6 Differential Reference Clock |
| L10    | HSSL6_D_VDD           | HSSL6 1.0V Digital Supply          |
| L11    | GND                   | Internal GND Plane                 |
| L12    | IO_B05D07_N           | Complex Bank05 I/O                 |
| L13    | IO_B05D07_P           | Complex Bank05 I/O                 |
| L14    | IO_B05D05_N           | Complex Bank05 I/O                 |
| L15    | IO_B05D05_P           | Complex Bank05 I/O                 |
| L16    | IO_B05D04_P           | Complex Bank05 I/O                 |
| L17    | GND                   | Internal GND Plane                 |
| L18    | IO_B07D04             | Direct Bank07 I/O                  |
| L19    | IO_B07D05             | Direct Bank07 I/O                  |
| L20    | IO_B07D12             | Direct Bank07 I/O                  |
| L21    | IO_B07D13             | Direct Bank07 I/O                  |
| L22    | GND                   | Internal GND Plane                 |

| Ball # | Pad Name            | Description                                |
|--------|---------------------|--------------------------------------------|
| L23    | IO_B07D18           | Direct Bank07 I/O                          |
| L24    | IO_B07D19           | Direct Bank07 I/O                          |
| L25    | SOC_BSCAN_SPI3_CS_N | SOC SPI                                    |
| L26    | SOC_BSCAN_SPI3_IO0  | SOC SPI                                    |
| L27    | GND                 | Internal GND Plane                         |
| L28    | SOC_BSCAN_SPI3_IO1  | SOC SPI                                    |
| L29    | SOC_BSCAN_SPI3_IO2  | SOC SPI                                    |
| L30    | SOC_BSCAN_SPI3_IO3  | SOC SPI                                    |
| L31    | SOC_BSCAN_SPI3_SCLK | SOC SPI                                    |
| L32    | GND                 | Internal GND Plane                         |
| L33    | SOC_BSCAN_VDDIO     | SOC I/O Bank 3.3V Supply                   |
| L34    | CKGEN5_PLL_VDD1V8A  | CKGEN5 PLL 1.8V Analog Supply              |
| L35    | SOC_DDR_VDDIO       | SOC DDR I/O Bank 1.2V, 1.5V or 1.8V Supply |
| L36    | SOC_DDR_DQ89        | SOC DDR                                    |
| L37    | SOC_DDR_DQ84        | SOC DDR                                    |
| L38    | SOC_DDR_VDDIO       | SOC DDR I/O Bank 1.2V, 1.5V or 1.8V Supply |
| L39    | SOC_DDR_DQ86        | SOC DDR                                    |
| L40    | SOC_DDR_DQSP10      | SOC DDR                                    |
| L41    | GND                 | Internal GND Plane                         |
| L42    | SOC_DDR_DQSP13_CKP  | SOC DDR                                    |
| M1     | HSSL6_TX1_N         | HSSL6 TX1 Channel                          |
| M2     | HSSL6_TX1_P         | HSSL6 TX1 Channel                          |
| M3     | GND                 | Internal GND Plane                         |
| M4     | HSSL6_VDDA          | HSSL6 TX Driver 1.0V Analog Supply         |
| M5     | HSSL6_RX1_N         | HSSL6 RX1 Channel                          |
| M6     | HSSL6_RX1_P         | HSSL6 RX1 Channel                          |
| M7     | GND                 | Internal GND Plane                         |
| M8     | HSSL6_VDD1V8A       | HSSL6 RX/TX 1.8V Analog Supply             |
| M9     | HSSL6_CKREF_N       | HSSL6 Differential Reference Clock         |
| M10    | HSSL6_D_VDD         | HSSL6 1.0V Digital Supply                  |
| M11    | GND                 | Internal GND Plane                         |
| M12    | IO_B05D06_N         | Complex Bank05 I/O                         |
| M13    | GND                 | Internal GND Plane                         |
| M14    | IO_B05D06_P         | Complex Bank05 I/O                         |
| M15    | IO_B05D04_N         | Complex Bank05 I/O                         |
| M16    | IO_B05_VDDIO        | Bank05 I/O Supply                          |
| M17    | IO_B07D06           | Direct Bank07 I/O                          |
| M18    | IO_B07D07           | Direct Bank07 I/O                          |
| M19    | IO_B07_VDDIO        | Bank07 I/O Supply                          |
| M20    | IO_B07D14           | Direct Bank07 I/O                          |
| M21    | IO_B07D15           | Direct Bank07 I/O                          |
| M22    | IO_B07D16           | Direct Bank07 I/O                          |
| M23    | IO_B07D17           | Direct Bank07 I/O                          |
| M24    | IO_B07_VDDIO        | Bank07 I/O Supply                          |

| Ball # | Pad Name             | Description                         |
|--------|----------------------|-------------------------------------|
| M25    | SOC_BSCAN_VDDIO      | SOC I/O Bank 3.3V Supply            |
| M26    | SOC_BSCAN_SPI4_CS_N  | SOC SPI                             |
| M27    | SOC_BSCAN_SPI4_IO0   | SOC SPI                             |
| M28    | SOC_BSCAN_SPI4_IO1   | SOC SPI                             |
| M29    | SOC_BSCAN_SPI4_IO2   | SOC SPI                             |
| M30    | SOC_BSCAN_SPI4_IO3   | SOC SPI                             |
| M31    | SOC_BSCAN_SPI4_SCLK  | SOC SPI                             |
| M32    | SOC_BSCAN_FLASH_NUM0 | SOC Config                          |
| M33    | SOC_BSCAN_FLASH_NUM1 | SOC Config                          |
| M34    | CKGEN5_PLL_VDDA      | CKGEN5 PLL 1V Analog Supply         |
| M35    | GND                  | Internal GND Plane                  |
| M36    | GND                  | Internal GND Plane                  |
| M37    | SOC_DDR_DQ83         | SOC DDR                             |
| M38    | SOC_DDR_DQ85         | SOC DDR                             |
| M39    | SOC_DDR_DM10         | SOC DDR                             |
| M40    | SOC_DDR_DQSN10       | SOC DDR                             |
| M41    | SOC_DDR_DQ113_A10    | SOC DDR                             |
| M42    | SOC_DDR_DQ114_A4     | SOC DDR                             |
| N1     | GND                  | Internal GND Plane                  |
| N2     | GND                  | Internal GND Plane                  |
| N3     | HSSL6_TX0_N          | HSSL6 TX0 Channel                   |
| N4     | HSSL6_TX0_P          | HSSL6 TX0 Channel                   |
| N5     | GND                  | Internal GND Plane                  |
| N6     | GND                  | Internal GND Plane                  |
| N7     | HSSL6_RX0_N          | HSSL6 RX0 Channel                   |
| N8     | HSSL6_RX0_P          | HSSL6 RX0 Channel                   |
| N9     | GND                  | Internal GND Plane                  |
| N10    | HSSL6_CALIBRATE      | HSSL6 TX/RX Termination Calibration |
| N11    | GND                  | Internal GND Plane                  |
| N12    | VDDCORE              | Internal VDD 1.0V Plane             |
| N13    | GND                  | Internal GND Plane                  |
| N14    | VDDCORE              | Internal VDD 1.0V Plane             |
| N15    | GND                  | Internal GND Plane                  |
| N16    | VDDCORE              | Internal VDD 1.0V Plane             |
| N17    | GND                  | Internal GND Plane                  |
| N18    | VDDCORE              | Internal VDD 1.0V Plane             |
| N19    | GND                  | Internal GND Plane                  |
| N20    | VDDCORE              | Internal VDD 1.0V Plane             |
| N21    | GND                  | Internal GND Plane                  |
| N22    | VDDCORE              | Internal VDD 1.0V Plane             |
| N23    | GND                  | Internal GND Plane                  |
| N24    | VDDCORE              | Internal VDD 1.0V Plane             |
| N25    | GND                  | Internal GND Plane                  |
| N26    | VDDCORE              | Internal VDD 1.0V Plane             |

| Ball # | Pad Name             | Description                                |
|--------|----------------------|--------------------------------------------|
| N27    | GND                  | Internal GND Plane                         |
| N28    | SOC_BSCAN_REFCLK1    | SOC Reference 100MHz max Freq,             |
| N29    | SOC_BSCAN_GPIO0      | SOC GPIO                                   |
| N30    | SOC_BSCAN_GPIO1      | SOC GPIO                                   |
| N31    | SOC_BSCAN_GPIO2      | SOC GPIO                                   |
| N32    | SOC_BSCAN_FLASH_MODE | SOC Config                                 |
| N33    | SOC_BSCAN_BOOT_SRC   | SOC Config                                 |
| N34    | CKGEN5_PLL_VDDA      | CKGEN5 PLL 1V Analog Supply                |
| N35    | SOC_DDR_VDDIO        | SOC DDR I/O Bank 1.2V, 1.5V or 1.8V Supply |
| N36    | SOC_DDR_DQ82         | SOC DDR                                    |
| N37    | SOC_DDR_DQ81         | SOC DDR                                    |
| N38    | SOC_DDR_DQ80         | SOC DDR                                    |
| N39    | SOC_DDR_DQ79         | SOC DDR                                    |
| N40    | SOC_DDR_DQ115_A0     | SOC DDR                                    |
| N41    | SOC_DDR_DQ116_CSN    | SOC DDR                                    |
| N42    | SOC_DDR_DQ106_CKE    | SOC DDR                                    |
| P1     | HSSL5_TX3_N          | HSSL5 TX3 Channel                          |
| P2     | HSSL5_TX3_P          | HSSL5 TX3 Channel                          |
| P3     | GND                  | Internal GND Plane                         |
| P4     | HSSL5_VDDA           | HSSL5 TX Driver 1.0V Analog Supply         |
| P5     | HSSL5_RX3_N          | HSSL5 RX3 Channel                          |
| P6     | HSSL5_RX3_P          | HSSL5 RX3 Channel                          |
| P7     | GND                  | Internal GND Plane                         |
| P8     | HSSL5_VDD1V8A        | HSSL5 RX/TX 1.8V Analog Supply             |
| P9     | GND                  | Internal GND Plane                         |
| P10    | HSSL5_D_VDD          | HSSL5 1.0V Digital Supply                  |
| P11    | GND                  | Internal GND Plane                         |
| P12    | GND                  | Internal GND Plane                         |
| P13    | VDDCORE              | Internal VDD 1.0V Plane                    |
| P14    | GND                  | Internal GND Plane                         |
| P15    | VDDCORE              | Internal VDD 1.0V Plane                    |
| P16    | GND                  | Internal GND Plane                         |
| P17    | VDDCORE              | Internal VDD 1.0V Plane                    |
| P18    | GND                  | Internal GND Plane                         |
| P19    | VDDCORE              | Internal VDD 1.0V Plane                    |
| P20    | GND                  | Internal GND Plane                         |
| P21    | VDDCORE              | Internal VDD 1.0V Plane                    |
| P22    | GND                  | Internal GND Plane                         |
| P23    | VDDCORE              | Internal VDD 1.0V Plane                    |
| P24    | GND                  | Internal GND Plane                         |
| P25    | VDDCORE              | Internal VDD 1.0V Plane                    |
| P26    | GND                  | Internal GND Plane                         |
| P27    | VDDCORE              | Internal VDD 1.0V Plane                    |
| P28    | GND                  | Internal GND Plane                         |

| Ball # | Pad Name          | Description                                |
|--------|-------------------|--------------------------------------------|
| P29    | SOC_BSCAN_VDDIO   | SOC I/O Bank 3.3V Supply                   |
| P30    | SOC_BSCAN_GPIO3   | SOC GPIO                                   |
| P31    | SOC_BSCAN_GPIO4   | SOC GPIO                                   |
| P32    | SOC_BSCAN_GPIO5   | SOC GPIO                                   |
| P33    | SOC_BSCAN_GPIO7   | SOC GPIO                                   |
| P34    | GND               | Internal GND Plane                         |
| P35    | SOC_DDR_VTO       | SOC DDR Termination Supply                 |
| P36    | SOC_DDR_VTO       | SOC DDR Termination Supply                 |
| P37    | SOC_DDR_DM9       | SOC DDR                                    |
| P38    | GND               | Internal GND Plane                         |
| P39    | SOC_DDR_DQ77      | SOC DDR                                    |
| P40    | SOC_DDR_DQ78      | SOC DDR                                    |
| P41    | SOC_DDR_VDDIO     | SOC DDR I/O Bank 1.2V, 1.5V or 1.8V Supply |
| P42    | SOC_DDR_DQ117_CAS | SOC DDR                                    |
| R1     | GND               | Internal GND Plane                         |
| R2     | GND               | Internal GND Plane                         |
| R3     | HSSL5_TX2_N       | HSSL5 TX2 Channel                          |
| R4     | HSSL5_TX2_P       | HSSL5 TX2 Channel                          |
| R5     | GND               | Internal GND Plane                         |
| R6     | GND               | Internal GND Plane                         |
| R7     | HSSL5_RX2_N       | HSSL5 RX2 Channel                          |
| R8     | HSSL5_RX2_P       | HSSL5 RX2 Channel                          |
| R9     | HSSL5_CKREF_P     | HSSL5 Differential Reference Clock         |
| R10    | HSSL5_D_VDD       | HSSL5 1.0V Digital Supply                  |
| R11    | GND               | Internal GND Plane                         |
| R12    | VDDCORE           | Internal VDD 1.0V Plane                    |
| R13    | GND               | Internal GND Plane                         |
| R14    | VDDCORE           | Internal VDD 1.0V Plane                    |
| R15    | GND               | Internal GND Plane                         |
| R16    | VDDCORE           | Internal VDD 1.0V Plane                    |
| R17    | GND               | Internal GND Plane                         |
| R18    | VDDCORE           | Internal VDD 1.0V Plane                    |
| R19    | GND               | Internal GND Plane                         |
| R20    | VDDCORE           | Internal VDD 1.0V Plane                    |
| R21    | GND               | Internal GND Plane                         |
| R22    | VDDCORE           | Internal VDD 1.0V Plane                    |
| R23    | GND               | Internal GND Plane                         |
| R24    | VDDCORE           | Internal VDD 1.0V Plane                    |
| R25    | GND               | Internal GND Plane                         |
| R26    | VDDCORE           | Internal VDD 1.0V Plane                    |
| R27    | GND               | Internal GND Plane                         |
| R28    | VDDCORE           | Internal VDD 1.0V Plane                    |
| R29    | SOC_BSCAN_REFCLK2 | SOC Reference 100MHz max Freq,             |
| R30    | SOC_BSCAN_UART_TX | SOC UART                                   |

| Ball # | Pad Name                | Description                        |
|--------|-------------------------|------------------------------------|
| R31    | SOC_BSCAN_UART_RX       | SOC UART                           |
| R32    | SOC_BSCAN_GPIO6         | SOC GPIO                           |
| R33    | SOC_PLL_VDD1V8          | SOC PLL Analog 1.8V Supply         |
| R34    | SOC_DDR_VTO             | SOC DDR Termination Supply         |
| R35    | SOC_DDR_VTO             | SOC DDR Termination Supply         |
| R36    | SOC_DDR_VTO             | SOC DDR Termination Supply         |
| R37    | SOC_DDR_DQSN9           | SOC DDR                            |
| R38    | SOC_DDR_DQ74            | SOC DDR                            |
| R39    | SOC_DDR_DQ75            | SOC DDR                            |
| R40    | SOC_DDR_DQ76            | SOC DDR                            |
| R41    | SOC_DDR_DQ118_A12       | SOC DDR                            |
| R42    | SOC_DDR_DQSN14_CKN      | SOC DDR                            |
| T1     | HSSL5_TX1_N             | HSSL5 TX1 Channel                  |
| T2     | HSSL5_TX1_P             | HSSL5 TX1 Channel                  |
| T3     | GND                     | Internal GND Plane                 |
| T4     | HSSL5_VDDA              | HSSL5 TX Driver 1.0V Analog Supply |
| T5     | HSSL5_RX1_N             | HSSL5 RX1 Channel                  |
| T6     | HSSL5_RX1_P             | HSSL5 RX1 Channel                  |
| T7     | GND                     | Internal GND Plane                 |
| T8     | HSSL5_VDD1V8A           | HSSL5 RX/TX 1.8V Analog Supply     |
| T9     | HSSL5_CKREF_N           | HSSL5 Differential Reference Clock |
| T10    | HSSL5_D_VDD             | HSSL5 1.0V Digital Supply          |
| T11    | GND                     | Internal GND Plane                 |
| T12    | GND                     | Internal GND Plane                 |
| T13    | VDDCORE                 | Internal VDD 1.0V Plane            |
| T14    | GND                     | Internal GND Plane                 |
| T15    | VDDCORE                 | Internal VDD 1.0V Plane            |
| T16    | GND                     | Internal GND Plane                 |
| T17    | VDDCORE                 | Internal VDD 1.0V Plane            |
| T18    | GND                     | Internal GND Plane                 |
| T19    | VDDCORE                 | Internal VDD 1.0V Plane            |
| T20    | GND                     | Internal GND Plane                 |
| T21    | VDDCORE                 | Internal VDD 1.0V Plane            |
| T22    | GND                     | Internal GND Plane                 |
| T23    | VDDCORE                 | Internal VDD 1.0V Plane            |
| T24    | GND                     | Internal GND Plane                 |
| T25    | VDDCORE                 | Internal VDD 1.0V Plane            |
| T26    | GND                     | Internal GND Plane                 |
| T27    | VDDCORE                 | Internal VDD 1.0V Plane            |
| T28    | GND                     | Internal GND Plane                 |
| T29    | SOC_BSCAN_UART_CTS_N    | SOC UART                           |
| T30    | SOC_BSCAN_UART_RTS_N    | SOC UART                           |
| T31    | SOC_BSCAN_POWER_ON_RSTN | SOC Config                         |
| T32    | GND                     | Internal GND Plane                 |

| Ball # | Pad Name              | Description                         |
|--------|-----------------------|-------------------------------------|
| T33    | SOC_BSCAN_MODE_BIST   | SOC Config                          |
| T34    | SOC_DDR_VTO           | SOC DDR Termination Supply          |
| T35    | SOC_DDR_VTO           | SOC DDR Termination Supply          |
| T36    | SOC_DDR_VTO           | SOC DDR Termination Supply          |
| T37    | SOC_DDR_DQSP9         | SOC DDR                             |
| T38    | SOC_DDR_DQ72          | SOC DDR                             |
| T39    | SOC_DDR_DQ73          | SOC DDR                             |
| T40    | SOC_DDR_DQ119_A3      | SOC DDR                             |
| T41    | SOC_DDR_DM15_BA1      | SOC DDR                             |
| T42    | SOC_DDR_DQSP14_CKP    | SOC DDR                             |
| U1     | GND                   | Internal GND Plane                  |
| U2     | GND                   | Internal GND Plane                  |
| U3     | HSSL5_TX0_N           | HSSL5 TX0 Channel                   |
| U4     | HSSL5_TX0_P           | HSSL5 TX0 Channel                   |
| U5     | GND                   | Internal GND Plane                  |
| U6     | GND                   | Internal GND Plane                  |
| U7     | HSSL5_RX0_N           | HSSL5 RX0 Channel                   |
| U8     | HSSL5_RX0_P           | HSSL5 RX0 Channel                   |
| U9     | GND                   | Internal GND Plane                  |
| U10    | HSSL5_CALIBRATE       | HSSL5 TX/RX Termination Calibration |
| U11    | GND                   | Internal GND Plane                  |
| U12    | VDDCORE               | Internal VDD 1.0V Plane             |
| U13    | GND                   | Internal GND Plane                  |
| U14    | VDDCORE               | Internal VDD 1.0V Plane             |
| U15    | GND                   | Internal GND Plane                  |
| U16    | VDDCORE               | Internal VDD 1.0V Plane             |
| U17    | GND                   | Internal GND Plane                  |
| U18    | VDDCORE               | Internal VDD 1.0V Plane             |
| U19    | GND                   | Internal GND Plane                  |
| U20    | VDDCORE               | Internal VDD 1.0V Plane             |
| U21    | GND                   | Internal GND Plane                  |
| U22    | VDDCORE               | Internal VDD 1.0V Plane             |
| U23    | GND                   | Internal GND Plane                  |
| U24    | VDDCORE               | Internal VDD 1.0V Plane             |
| U25    | GND                   | Internal GND Plane                  |
| U26    | VDDCORE               | Internal VDD 1.0V Plane             |
| U27    | GND                   | Internal GND Plane                  |
| U28    | VDDCORE               | Internal VDD 1.0V Plane             |
| U29    | SOC_BSCAN_BL0_RUNNING | Flag BL0 RunningSOC Config          |
| U30    | SOC_BSCAN_BOOT_ERROR  | Flag Boot ErrorSOC Config           |
| U31    | SOC_BSCAN_MODE_SCAN   | SOC Config                          |
| U32    | SOC_BSCAN_SYSTEM_RSTN | SOC Config                          |
| U33    | SOC_PLL_VDDA          | SOC PLL Analog 1V Supply            |
| U34    | SOC_DDR_VTO           | SOC DDR Termination Supply          |

| Ball # | Pad Name                     | Description                                |
|--------|------------------------------|--------------------------------------------|
| U35    | SOC_DDR_VTO                  | SOC DDR Termination Supply                 |
| U36    | GND                          | Internal GND Plane                         |
| U37    | SOC_DDR_DQ71                 | SOC DDR                                    |
| U38    | SOC_DDR_VDDIO                | SOC DDR I/O Bank 1.2V, 1.5V or 1.8V Supply |
| U39    | SOC_DDR_DQSN8                | SOC DDR                                    |
| U40    | SOC_DDR_DQSP8                | SOC DDR                                    |
| U41    | GND                          | Internal GND Plane                         |
| U42    | SOC_DDR_DQ120_A1             | SOC DDR                                    |
| V1     | HSSL4_TX3_N                  | HSSL4 TX3 Channel                          |
| V2     | HSSL4_TX3_P                  | HSSL4 TX3 Channel                          |
| V3     | GND                          | Internal GND Plane                         |
| V4     | HSSL4_VDDA                   | HSSL4 TX Driver 1.0V Analog Supply         |
| V5     | HSSL4_RX3_N                  | HSSL4 RX3 Channel                          |
| V6     | HSSL4_RX3_P                  | HSSL4 RX3 Channel                          |
| V7     | GND                          | Internal GND Plane                         |
| V8     | HSSL4_VDD1V8A                | HSSL4 RX/TX 1.8V Analog Supply             |
| V9     | GND                          | Internal GND Plane                         |
| V10    | HSSL4_D_VDD                  | HSSL4 1.0V Digital Supply                  |
| V11    | GND                          | Internal GND Plane                         |
| V12    | GND                          | Internal GND Plane                         |
| V13    | VDDCORE                      | Internal VDD 1.0V Plane                    |
| V14    | GND                          | Internal GND Plane                         |
| V15    | VDDCORE                      | Internal VDD 1.0V Plane                    |
| V16    | GND                          | Internal GND Plane                         |
| V17    | VDDCORE                      | Internal VDD 1.0V Plane                    |
| V18    | GND                          | Internal GND Plane                         |
| V19    | VDDCORE                      | Internal VDD 1.0V Plane                    |
| V20    | GND                          | Internal GND Plane                         |
| V21    | VDDCORE                      | Internal VDD 1.0V Plane                    |
| V22    | GND                          | Internal GND Plane                         |
| V23    | VDDCORE                      | Internal VDD 1.0V Plane                    |
| V24    | GND                          | Internal GND Plane                         |
| V25    | VDDCORE                      | Internal VDD 1.0V Plane                    |
| V26    | GND                          | Internal GND Plane                         |
| V27    | VDDCORE                      | Internal VDD 1.0V Plane                    |
| V28    | GND                          | Internal GND Plane                         |
| V29    | VDDCORE                      | Internal VDD 1.0V Plane                    |
| V30    | SOC_BSCAN_MODE_TEST          | SOC Config                                 |
| V31    | SOC_BSCAN_MREPAIR_SEQ_BYPASS | SOC Config                                 |
| V32    | SOC_BSCAN_POST_MORTEM        | SOC Config                                 |
| V33    | SOC_BSCAN_VDDIO              | SOC I/O Bank 3.3V Supply                   |
| V34    | SOC_DDR_VTO                  | SOC DDR Termination Supply                 |
| V35    | SOC_DDR_VTO                  | SOC DDR Termination Supply                 |
| V36    | SOC_DDR_VTO                  | SOC DDR Termination Supply                 |

| Ball # | Pad Name          | Description                        |
|--------|-------------------|------------------------------------|
| V37    | SOC_DDR_DQ70      | SOC DDR                            |
| V38    | SOC_DDR_DQ69      | SOC DDR                            |
| V39    | SOC_DDR_DQ68      | SOC DDR                            |
| V40    | SOC_DDR_DM8       | SOC DDR                            |
| V41    | SOC_DDR_DQ122_RAS | SOC DDR                            |
| V42    | SOC_DDR_DQ121_A9  | SOC DDR                            |
| W1     | GND               | Internal GND Plane                 |
| W2     | GND               | Internal GND Plane                 |
| W3     | HSSL4_TX2_N       | HSSL4 TX2 Channel                  |
| W4     | HSSL4_TX2_P       | HSSL4 TX2 Channel                  |
| W5     | GND               | Internal GND Plane                 |
| W6     | GND               | Internal GND Plane                 |
| W7     | HSSL4_RX2_N       | HSSL4 RX2 Channel                  |
| W8     | HSSL4_RX2_P       | HSSL4 RX2 Channel                  |
| W9     | HSSL4_CKREF_P     | HSSL4 Differential Reference Clock |
| W10    | HSSL4_D_VDD       | HSSL4 1.0V Digital Supply          |
| W11    | GND               | Internal GND Plane                 |
| W12    | VDDCORE           | Internal VDD 1.0V Plane            |
| W13    | GND               | Internal GND Plane                 |
| W14    | VDDCORE           | Internal VDD 1.0V Plane            |
| W15    | GND               | Internal GND Plane                 |
| W16    | VDDCORE           | Internal VDD 1.0V Plane            |
| W17    | GND               | Internal GND Plane                 |
| W18    | VDDCORE           | Internal VDD 1.0V Plane            |
| W19    | GND               | Internal GND Plane                 |
| W20    | VDDCORE           | Internal VDD 1.0V Plane            |
| W21    | GND               | Internal GND Plane                 |
| W22    | VDDCORE           | Internal VDD 1.0V Plane            |
| W23    | GND               | Internal GND Plane                 |
| W24    | VDDCORE           | Internal VDD 1.0V Plane            |
| W25    | GND               | Internal GND Plane                 |
| W26    | VDD1V8A           | Auxiliary Analog 1.8V              |
| W27    | VDD1V8A           | Auxiliary Analog 1.8V              |
| W28    | VDDCORE           | Internal VDD 1.0V Plane            |
| W29    | GND               | Internal GND Plane                 |
| W30    | SOC_VDDCORE       | SOC core logic 1V Supply           |
| W31    | GND               | Internal GND Plane                 |
| W32    | SOC_VDDCORE       | SOC core logic 1V Supply           |
| W33    | GND               | Internal GND Plane                 |
| W34    | SOC_VDDCORE       | SOC core logic 1V Supply           |
| W35    | SOC_DDR_VTO       | SOC DDR Termination Supply         |
| W36    | SOC_DDR_VTO       | SOC DDR Termination Supply         |
| W37    | SOC_DDR_DQ65      | SOC DDR                            |
| W38    | SOC_DDR_DQ66      | SOC DDR                            |

| Ball # | Pad Name          | Description                                |
|--------|-------------------|--------------------------------------------|
| W39    | SOC_DDR_DQ67      | SOC DDR                                    |
| W40    | SOC_DDR_DQ123_BG1 | SOC DDR                                    |
| W41    | SOC_DDR_DQ124_A5  | SOC DDR                                    |
| W42    | SOC_DDR_DQ125_A7  | SOC DDR                                    |
| Y1     | HSSL4_TX1_N       | HSSL4 TX1 Channel                          |
| Y2     | HSSL4_TX1_P       | HSSL4 TX1 Channel                          |
| Y3     | GND               | Internal GND Plane                         |
| Y4     | HSSL4_VDDA        | HSSL4 TX Driver 1.0V Analog Supply         |
| Y5     | HSSL4_RX1_N       | HSSL4 RX1 Channel                          |
| Y6     | HSSL4_RX1_P       | HSSL4 RX1 Channel                          |
| Y7     | GND               | Internal GND Plane                         |
| Y8     | HSSL4_VDD1V8A     | HSSL4 RX/TX 1.8V Analog Supply             |
| Y9     | HSSL4_CKREF_N     | HSSL4 Differential Reference Clock         |
| Y10    | HSSL4_D_VDD       | HSSL4 1.0V Digital Supply                  |
| Y11    | GND               | Internal GND Plane                         |
| Y12    | GND               | Internal GND Plane                         |
| Y13    | VDDCORE           | Internal VDD 1.0V Plane                    |
| Y14    | GND               | Internal GND Plane                         |
| Y15    | VDDCORE           | Internal VDD 1.0V Plane                    |
| Y16    | GND               | Internal GND Plane                         |
| Y17    | VDDCORE           | Internal VDD 1.0V Plane                    |
| Y18    | GND               | Internal GND Plane                         |
| Y19    | VDDCORE           | Internal VDD 1.0V Plane                    |
| Y20    | GND               | Internal GND Plane                         |
| Y21    | VDDCORE           | Internal VDD 1.0V Plane                    |
| Y22    | GND               | Internal GND Plane                         |
| Y23    | VDDCORE           | Internal VDD 1.0V Plane                    |
| Y24    | GND               | Internal GND Plane                         |
| Y25    | VDDCORE           | Internal VDD 1.0V Plane                    |
| Y26    | VDD1V8A           | Auxiliary Analog 1.8V                      |
| Y27    | VDD1V8A           | Auxiliary Analog 1.8V                      |
| Y28    | GND               | Internal GND Plane                         |
| Y29    | VDDCORE           | Internal VDD 1.0V Plane                    |
| Y30    | GND               | Internal GND Plane                         |
| Y31    | SOC_VDDCORE       | SOC core logic 1V Supply                   |
| Y32    | GND               | Internal GND Plane                         |
| Y33    | SOC_VDDCORE       | SOC core logic 1V Supply                   |
| Y34    | GND               | Internal GND Plane                         |
| Y35    | SOC_DDR_VDDIO     | SOC DDR I/O Bank 1.2V, 1.5V or 1.8V Supply |
| Y36    | SOC_DDR_DM7       | SOC DDR                                    |
| Y37    | SOC_DDR_DQ64      | SOC DDR                                    |
| Y38    | GND               | Internal GND Plane                         |
| Y39    | SOC_DDR_DQ63      | SOC DDR                                    |
| Y40    | SOC_DDR_DQ62      | SOC DDR                                    |

| Ball # | Pad Name           | Description                                |
|--------|--------------------|--------------------------------------------|
| Y41    | SOC_DDR_VDDIO      | SOC DDR I/O Bank 1.2V, 1.5V or 1.8V Supply |
| Y42    | SOC_DDR_DQ126_A13  | SOC DDR                                    |
| AA1    | GND                | Internal GND Plane                         |
| AA2    | GND                | Internal GND Plane                         |
| AA3    | HSSL4_TX0_N        | HSSL4 TX0 Channel                          |
| AA4    | HSSL4_TX0_P        | HSSL4 TX0 Channel                          |
| AA5    | GND                | Internal GND Plane                         |
| AA6    | GND                | Internal GND Plane                         |
| AA7    | HSSL4_RX0_N        | HSSL4 RX0 Channel                          |
| AA8    | HSSL4_RX0_P        | HSSL4 RX0 Channel                          |
| AA9    | GND                | Internal GND Plane                         |
| AA10   | HSSL4_CALIBRATE    | HSSL4 TX/RX Termination Calibration        |
| AA11   | GND                | Internal GND Plane                         |
| AA12   | CKGEN2_PLL_VDD1V8A | CKGEN2 PLL 1.8V Analog Supply              |
| AA13   | GND                | Internal GND Plane                         |
| AA14   | VDDCORE            | Internal VDD 1.0V Plane                    |
| AA15   | GND                | Internal GND Plane                         |
| AA16   | VDDCORE            | Internal VDD 1.0V Plane                    |
| AA17   | GND                | Internal GND Plane                         |
| AA18   | VDDCORE            | Internal VDD 1.0V Plane                    |
| AA19   | GND                | Internal GND Plane                         |
| AA20   | VDDCORE            | Internal VDD 1.0V Plane                    |
| AA21   | SENSE              | VDD 1.0V SENSE                             |
| AA22   | VDDCORE            | Internal VDD 1.0V Plane                    |
| AA23   | GND                | Internal GND Plane                         |
| AA24   | VDDCORE            | Internal VDD 1.0V Plane                    |
| AA25   | GND                | Internal GND Plane                         |
| AA26   | VDD1V8A            | Auxiliary Analog 1.8V                      |
| AA27   | VDD1V8A            | Auxiliary Analog 1.8V                      |
| AA28   | VDDCORE            | Internal VDD 1.0V Plane                    |
| AA29   | GND                | Internal GND Plane                         |
| AA30   | SOC_VDDCORE        | SOC core logic 1V Supply                   |
| AA31   | GND                | Internal GND Plane                         |
| AA32   | SOC_VDDCORE        | SOC core logic 1V Supply                   |
| AA33   | GND                | Internal GND Plane                         |
| AA34   | SOC_VDDCORE        | SOC core logic 1V Supply                   |
| AA35   | SOC_DDR_DQSN7      | SOC DDR                                    |
| AA36   | SOC_DDR_DQ58       | SOC DDR                                    |
| AA37   | SOC_DDR_DQ59       | SOC DDR                                    |
| AA38   | SOC_DDR_DQ60       | SOC DDR                                    |
| AA39   | SOC_DDR_DQ61       | SOC DDR                                    |
| AA40   | SOC_DDR_DM6        | SOC DDR                                    |
| AA41   | SOC_DDR_DM13_BG0   | SOC DDR                                    |
| AA42   | SOC_DDR_DQ127_CKE  | SOC DDR                                    |

| Ball # | Pad Name        | Description                        |
|--------|-----------------|------------------------------------|
| AB1    | HSSL3_TX3_N     | HSSL3 TX3 Channel                  |
| AB2    | HSSL3_TX3_P     | HSSL3 TX3 Channel                  |
| AB3    | GND             | Internal GND Plane                 |
| AB4    | HSSL3_VDDA      | HSSL3 TX Driver 1.0V Analog Supply |
| AB5    | HSSL3_RX3_N     | HSSL3 RX3 Channel                  |
| AB6    | HSSL3_RX3_P     | HSSL3 RX3 Channel                  |
| AB7    | GND             | Internal GND Plane                 |
| AB8    | HSSL3_VDD1V8A   | HSSL3 RX/TX 1.8V Analog Supply     |
| AB9    | GND             | Internal GND Plane                 |
| AB10   | HSSL3_D_VDD     | HSSL3 1.0V Digital Supply          |
| AB11   | GND             | Internal GND Plane                 |
| AB12   | CKGEN2_PLL_VDDA | CKGEN2 PLL 1V Analog Supply        |
| AB13   | VDDCORE         | Internal VDD 1.0V Plane            |
| AB14   | GND             | Internal GND Plane                 |
| AB15   | VDDCORE         | Internal VDD 1.0V Plane            |
| AB16   | GND             | Internal GND Plane                 |
| AB17   | VDDCORE         | Internal VDD 1.0V Plane            |
| AB18   | GND             | Internal GND Plane                 |
| AB19   | VDDCORE         | Internal VDD 1.0V Plane            |
| AB20   | GND             | Internal GND Plane                 |
| AB21   | VDDCORE         | Internal VDD 1.0V Plane            |
| AB22   | GND             | Internal GND Plane                 |
| AB23   | VDDCORE         | Internal VDD 1.0V Plane            |
| AB24   | GND             | Internal GND Plane                 |
| AB25   | VDDCORE         | Internal VDD 1.0V Plane            |
| AB26   | VDD1V8A         | Auxiliary Analog 1.8V              |
| AB27   | VDD1V8A         | Auxiliary Analog 1.8V              |
| AB28   | GND             | Internal GND Plane                 |
| AB29   | VDDCORE         | Internal VDD 1.0V Plane            |
| AB30   | GND             | Internal GND Plane                 |
| AB31   | SOC_VDDCORE     | SOC core logic 1V Supply           |
| AB32   | GND             | Internal GND Plane                 |
| AB33   | SOC_VDDCORE     | SOC core logic 1V Supply           |
| AB34   | GND             | Internal GND Plane                 |
| AB35   | SOC_DDR_DQSP7   | SOC DDR                            |
| AB36   | SOC_DDR_DQ55    | SOC DDR                            |
| AB37   | SOC_DDR_DQ56    | SOC DDR                            |
| AB38   | SOC_DDR_DQ57    | SOC DDR                            |
| AB39   | SOC_DDR_DQSN6   | SOC DDR                            |
| AB40   | SOC_DDR_DQSP6   | SOC DDR                            |
| AB41   | SOC_DDR_BG0     | SOC DDR                            |
| AB42   | SOC_DDR_WEN     | SOC DDR                            |
| AC1    | GND             | Internal GND Plane                 |
| AC2    | GND             | Internal GND Plane                 |

| Ball # | Pad Name           | Description                                |
|--------|--------------------|--------------------------------------------|
| AC3    | HSSL3_TX2_N        | HSSL3 TX2 Channel                          |
| AC4    | HSSL3_TX2_P        | HSSL3 TX2 Channel                          |
| AC5    | GND                | Internal GND Plane                         |
| AC6    | GND                | Internal GND Plane                         |
| AC7    | HSSL3_RX2_N        | HSSL3 RX2 Channel                          |
| AC8    | HSSL3_RX2_P        | HSSL3 RX2 Channel                          |
| AC9    | HSSL3_CKREF_P      | HSSL3 Differential Reference Clock         |
| AC10   | HSSL3_D_VDD        | HSSL3 1.0V Digital Supply                  |
| AC11   | GND                | Internal GND Plane                         |
| AC12   | CKGEN2_PLL_VDD1V8A | CKGEN2 PLL 1.8V Analog Supply              |
| AC13   | GND                | Internal GND Plane                         |
| AC14   | VDDCORE            | Internal VDD 1.0V Plane                    |
| AC15   | GND                | Internal GND Plane                         |
| AC16   | VDDCORE            | Internal VDD 1.0V Plane                    |
| AC17   | GND                | Internal GND Plane                         |
| AC18   | VDDCORE            | Internal VDD 1.0V Plane                    |
| AC19   | GND                | Internal GND Plane                         |
| AC20   | VDDCORE            | Internal VDD 1.0V Plane                    |
| AC21   | GND                | Internal GND Plane                         |
| AC22   | VDDCORE            | Internal VDD 1.0V Plane                    |
| AC23   | GND                | Internal GND Plane                         |
| AC24   | VDDCORE            | Internal VDD 1.0V Plane                    |
| AC25   | GND                | Internal GND Plane                         |
| AC26   | VDD1V8A            | Auxiliary Analog 1.8V                      |
| AC27   | VDD1V8A            | Auxiliary Analog 1.8V                      |
| AC28   | VDDCORE            | Internal VDD 1.0V Plane                    |
| AC29   | GND                | Internal GND Plane                         |
| AC30   | SOC_VDDCORE        | SOC core logic 1V Supply                   |
| AC31   | GND                | Internal GND Plane                         |
| AC32   | SOC_VDDCORE        | SOC core logic 1V Supply                   |
| AC33   | GND                | Internal GND Plane                         |
| AC34   | SOC_VDDCORE        | SOC core logic 1V Supply                   |
| AC35   | GND                | Internal GND Plane                         |
| AC36   | SOC_DDR_DQ54       | SOC DDR                                    |
| AC37   | SOC_DDR_DQ53       | SOC DDR                                    |
| AC38   | SOC_DDR_VDDIO      | SOC DDR I/O Bank 1.2V, 1.5V or 1.8V Supply |
| AC39   | SOC_DDR_DQ52       | SOC DDR                                    |
| AC40   | SOC_DDR_DQ51       | SOC DDR                                    |
| AC41   | GND                | Internal GND Plane                         |
| AC42   | SOC_DDR_RST        | SOC DDR                                    |
| AD1    | HSSL3_TX1_N        | HSSL3 TX1 Channel                          |
| AD2    | HSSL3_TX1_P        | HSSL3 TX1 Channel                          |
| AD3    | GND                | Internal GND Plane                         |
| AD4    | HSSL3_VDDA         | HSSL3 TX Driver 1.0V Analog Supply         |

| Ball # | Pad Name      | Description                        |
|--------|---------------|------------------------------------|
| AD5    | HSSL3_RX1_N   | HSSL3 RX1 Channel                  |
| AD6    | HSSL3_RX1_P   | HSSL3 RX1 Channel                  |
| AD7    | GND           | Internal GND Plane                 |
| AD8    | HSSL3_VDD1V8A | HSSL3 RX/TX 1.8V Analog Supply     |
| AD9    | HSSL3_CKREF_N | HSSL3 Differential Reference Clock |
| AD10   | HSSL3_D_VDD   | HSSL3 1.0V Digital Supply          |
| AD11   | GND           | Internal GND Plane                 |
| AD12   | GND           | Internal GND Plane                 |
| AD13   | VDDCORE       | Internal VDD 1.0V Plane            |
| AD14   | GND           | Internal GND Plane                 |
| AD15   | VDDCORE       | Internal VDD 1.0V Plane            |
| AD16   | GND           | Internal GND Plane                 |
| AD17   | VDDCORE       | Internal VDD 1.0V Plane            |
| AD18   | GND           | Internal GND Plane                 |
| AD19   | VDDCORE       | Internal VDD 1.0V Plane            |
| AD20   | GND           | Internal GND Plane                 |
| AD21   | VDDCORE       | Internal VDD 1.0V Plane            |
| AD22   | GND           | Internal GND Plane                 |
| AD23   | VDDCORE       | Internal VDD 1.0V Plane            |
| AD24   | GND           | Internal GND Plane                 |
| AD25   | VDDCORE       | Internal VDD 1.0V Plane            |
| AD26   | GND           | Internal GND Plane                 |
| AD27   | VDDCORE       | Internal VDD 1.0V Plane            |
| AD28   | GND           | Internal GND Plane                 |
| AD29   | VDDCORE       | Internal VDD 1.0V Plane            |
| AD30   | GND           | Internal GND Plane                 |
| AD31   | SOC_VDDCORE   | SOC core logic 1V Supply           |
| AD32   | GND           | Internal GND Plane                 |
| AD33   | SOC_VDDCORE   | SOC core logic 1V Supply           |
| AD34   | GND           | Internal GND Plane                 |
| AD35   | SOC_DDR_DQSN5 | SOC DDR                            |
| AD36   | SOC_DDR_DM5   | SOC DDR                            |
| AD37   | SOC_DDR_DQ47  | SOC DDR                            |
| AD38   | SOC_DDR_DQ48  | SOC DDR                            |
| AD39   | SOC_DDR_DQ49  | SOC DDR                            |
| AD40   | SOC_DDR_DQ50  | SOC DDR                            |
| AD41   | SOC_DDR_BG1   | SOC DDR                            |
| AD42   | SOC_DDR_RAS   | SOC DDR                            |
| AE1    | GND           | Internal GND Plane                 |
| AE2    | GND           | Internal GND Plane                 |
| AE3    | HSSL3_TX0_N   | HSSL3 TX0 Channel                  |
| AE4    | HSSL3_TX0_P   | HSSL3 TX0 Channel                  |
| AE5    | GND           | Internal GND Plane                 |
| AE6    | GND           | Internal GND Plane                 |

| Ball # | Pad Name        | Description                         |
|--------|-----------------|-------------------------------------|
| AE7    | HSSL3_RX0_N     | HSSL3 RX0 Channel                   |
| AE8    | HSSL3_RX0_P     | HSSL3 RX0 Channel                   |
| AE9    | GND             | Internal GND Plane                  |
| AE10   | HSSL3_CALIBRATE | HSSL3 TX/RX Termination Calibration |
| AE11   | GND             | Internal GND Plane                  |
| AE12   | VDDCORE         | Internal VDD 1.0V Plane             |
| AE13   | GND             | Internal GND Plane                  |
| AE14   | VDDCORE         | Internal VDD 1.0V Plane             |
| AE15   | GND             | Internal GND Plane                  |
| AE16   | VDDCORE         | Internal VDD 1.0V Plane             |
| AE17   | GND             | Internal GND Plane                  |
| AE18   | VDDCORE         | Internal VDD 1.0V Plane             |
| AE19   | GND             | Internal GND Plane                  |
| AE20   | VDDCORE         | Internal VDD 1.0V Plane             |
| AE21   | GND             | Internal GND Plane                  |
| AE22   | VDDCORE         | Internal VDD 1.0V Plane             |
| AE23   | GND             | Internal GND Plane                  |
| AE24   | VDDCORE         | Internal VDD 1.0V Plane             |
| AE25   | GND             | Internal GND Plane                  |
| AE26   | VDDCORE         | Internal VDD 1.0V Plane             |
| AE27   | GND             | Internal GND Plane                  |
| AE28   | VDDCORE         | Internal VDD 1.0V Plane             |
| AE29   | GND             | Internal GND Plane                  |
| AE30   | SOC_VDDCORE     | SOC core logic 1V Supply            |
| AE31   | GND             | Internal GND Plane                  |
| AE32   | SOC_VDDCORE     | SOC core logic 1V Supply            |
| AE33   | GND             | Internal GND Plane                  |
| AE34   | SOC_VDDCORE     | SOC core logic 1V Supply            |
| AE35   | SOC_DDR_DQSP5   | SOC DDR                             |
| AE36   | SOC_DDR_DQ46    | SOC DDR                             |
| AE37   | SOC_DDR_DQ45    | SOC DDR                             |
| AE38   | SOC_DDR_DQ44    | SOC DDR                             |
| AE39   | SOC_DDR_DQ43    | SOC DDR                             |
| AE40   | SOC_DDR_DQ42    | SOC DDR                             |
| AE41   | SOC_DDR_BA0     | SOC DDR                             |
| AE42   | SOC_DDR_ACT     | SOC DDR                             |
| AF1    | HSSL2_TX3_N     | HSSL2 TX3 Channel                   |
| AF2    | HSSL2_TX3_P     | HSSL2 TX3 Channel                   |
| AF3    | GND             | Internal GND Plane                  |
| AF4    | HSSL2_VDDA      | HSSL2 TX Driver 1.0V Analog Supply  |
| AF5    | HSSL2_RX3_N     | HSSL2 RX3 Channel                   |
| AF6    | HSSL2_RX3_P     | HSSL2 RX3 Channel                   |
| AF7    | GND             | Internal GND Plane                  |
| AF8    | HSSL2_VDD1V8A   | HSSL2 RX/TX 1.8V Analog Supply      |

| Ball # | Pad Name      | Description                                |
|--------|---------------|--------------------------------------------|
| AF9    | GND           | Internal GND Plane                         |
| AF10   | HSSL2_D_VDD   | HSSL2 1.0V Digital Supply                  |
| AF11   | GND           | Internal GND Plane                         |
| AF12   | GND           | Internal GND Plane                         |
| AF13   | VDDCORE       | Internal VDD 1.0V Plane                    |
| AF14   | GND           | Internal GND Plane                         |
| AF15   | VDDCORE       | Internal VDD 1.0V Plane                    |
| AF16   | GND           | Internal GND Plane                         |
| AF17   | VDDCORE       | Internal VDD 1.0V Plane                    |
| AF18   | GND           | Internal GND Plane                         |
| AF19   | VDDCORE       | Internal VDD 1.0V Plane                    |
| AF20   | GND           | Internal GND Plane                         |
| AF21   | VDDCORE       | Internal VDD 1.0V Plane                    |
| AF22   | GND           | Internal GND Plane                         |
| AF23   | VDDCORE       | Internal VDD 1.0V Plane                    |
| AF24   | GND           | Internal GND Plane                         |
| AF25   | VDDCORE       | Internal VDD 1.0V Plane                    |
| AF26   | GND           | Internal GND Plane                         |
| AF27   | VDDCORE       | Internal VDD 1.0V Plane                    |
| AF28   | GND           | Internal GND Plane                         |
| AF29   | VDDCORE       | Internal VDD 1.0V Plane                    |
| AF30   | GND           | Internal GND Plane                         |
| AF31   | READY         | Ready Flag                                 |
| AF32   | ERROR         | Error Flag                                 |
| AF33   | GND           | Internal GND Plane                         |
| AF34   | SOC_DDR_VDDS  | SOC DDR 1.8V On-Chip Termination Supply    |
| AF35   | SOC_DDR_VDDIO | SOC DDR I/O Bank 1.2V, 1.5V or 1.8V Supply |
| AF36   | SOC_DDR_DM4   | SOC DDR                                    |
| AF37   | SOC_DDR_DQ39  | SOC DDR                                    |
| AF38   | GND           | Internal GND Plane                         |
| AF39   | SOC_DDR_DQ40  | SOC DDR                                    |
| AF40   | SOC_DDR_DQ41  | SOC DDR                                    |
| AF41   | SOC_DDR_VDDIO | SOC DDR I/O Bank 1.2V, 1.5V or 1.8V Supply |
| AF42   | SOC_DDR_CAS   | SOC DDR                                    |
| AG1    | GND           | Internal GND Plane                         |
| AG2    | GND           | Internal GND Plane                         |
| AG3    | HSSL2_TX2_N   | HSSL2 TX2 Channel                          |
| AG4    | HSSL2_TX2_P   | HSSL2 TX2 Channel                          |
| AG5    | GND           | Internal GND Plane                         |
| AG6    | GND           | Internal GND Plane                         |
| AG7    | HSSL2_RX2_N   | HSSL2 RX2 Channel                          |
| AG8    | HSSL2_RX2_P   | HSSL2 RX2 Channel                          |
| AG9    | HSSL2_CKREF_P | HSSL2 Differential Reference Clock         |
| AG10   | HSSL2_D_VDD   | HSSL2 1.0V Digital Supply                  |

| Ball # | Pad Name           | Description                             |
|--------|--------------------|-----------------------------------------|
| AG11   | GND                | Internal GND Plane                      |
| AG12   | VDDCORE            | Internal VDD 1.0V Plane                 |
| AG13   | GND                | Internal GND Plane                      |
| AG14   | VDDCORE            | Internal VDD 1.0V Plane                 |
| AG15   | GND                | Internal GND Plane                      |
| AG16   | VDDCORE            | Internal VDD 1.0V Plane                 |
| AG17   | GND                | Internal GND Plane                      |
| AG18   | VDDCORE            | Internal VDD 1.0V Plane                 |
| AG19   | GND                | Internal GND Plane                      |
| AG20   | VDDCORE            | Internal VDD 1.0V Plane                 |
| AG21   | GND                | Internal GND Plane                      |
| AG22   | VDDCORE            | Internal VDD 1.0V Plane                 |
| AG23   | GND                | Internal GND Plane                      |
| AG24   | VDDCORE            | Internal VDD 1.0V Plane                 |
| AG25   | GND                | Internal GND Plane                      |
| AG26   | VDDCORE            | Internal VDD 1.0V Plane                 |
| AG27   | GND                | Internal GND Plane                      |
| AG28   | VDDCORE            | Internal VDD 1.0V Plane                 |
| AG29   | GND                | Internal GND Plane                      |
| AG30   | VDDCORE            | Internal VDD 1.0V Plane                 |
| AG31   | TRIGGER            | Trigger Flag                            |
| AG32   | RST_SOFT_N         | Bitstream Manager Reset                 |
| AG33   | SOC_DDR_VDDS       | SOC DDR 1.8V On-Chip Termination Supply |
| AG34   | SOC_DDR_VDDS       | SOC DDR 1.8V On-Chip Termination Supply |
| AG35   | SOC_DDR_DQSN4      | SOC DDR                                 |
| AG36   | SOC_DDR_DQ38       | SOC DDR                                 |
| AG37   | SOC_DDR_DQ37       | SOC DDR                                 |
| AG38   | SOC_DDR_DQ36       | SOC DDR                                 |
| AG39   | SOC_DDR_DQ35       | SOC DDR                                 |
| AG40   | SOC_DDR_ODT        | SOC DDR                                 |
| AG41   | SOC_DDR_BA1        | SOC DDR                                 |
| AG42   | SOC_DDR_DQSN15_CKN | SOC DDR                                 |
| AH1    | HSSL2_TX1_N        | HSSL2 TX1 Channel                       |
| AH2    | HSSL2_TX1_P        | HSSL2 TX1 Channel                       |
| AH3    | GND                | Internal GND Plane                      |
| AH4    | HSSL2_VDDA         | HSSL2 TX Driver 1.0V Analog Supply      |
| AH5    | HSSL2_RX1_N        | HSSL2 RX1 Channel                       |
| AH6    | HSSL2_RX1_P        | HSSL2 RX1 Channel                       |
| AH7    | GND                | Internal GND Plane                      |
| AH8    | HSSL2_VDD1V8A      | HSSL2 RX/TX 1.8V Analog Supply          |
| AH9    | HSSL2_CKREF_N      | HSSL2 Differential Reference Clock      |
| AH10   | HSSL2_D_VDD        | HSSL2 1.0V Digital Supply               |
| AH11   | GND                | Internal GND Plane                      |
| AH12   | GND                | Internal GND Plane                      |

| Ball # | Pad Name           | Description                                |
|--------|--------------------|--------------------------------------------|
| AH13   | VDDCORE            | Internal VDD 1.0V Plane                    |
| AH14   | GND                | Internal GND Plane                         |
| AH15   | VDDCORE            | Internal VDD 1.0V Plane                    |
| AH16   | GND                | Internal GND Plane                         |
| AH17   | VDDCORE            | Internal VDD 1.0V Plane                    |
| AH18   | GND                | Internal GND Plane                         |
| AH19   | VDDCORE            | Internal VDD 1.0V Plane                    |
| AH20   | GND                | Internal GND Plane                         |
| AH21   | VDDCORE            | Internal VDD 1.0V Plane                    |
| AH22   | GND                | Internal GND Plane                         |
| AH23   | VDDCORE            | Internal VDD 1.0V Plane                    |
| AH24   | GND                | Internal GND Plane                         |
| AH25   | VDDCORE            | Internal VDD 1.0V Plane                    |
| AH26   | GND                | Internal GND Plane                         |
| AH27   | VDDCORE            | Internal VDD 1.0V Plane                    |
| AH28   | GND                | Internal GND Plane                         |
| AH29   | VDDCORE            | Internal VDD 1.0V Plane                    |
| AH30   | GND                | Internal GND Plane                         |
| AH31   | MODE0              | Chip Mode Input                            |
| AH32   | VDDIO_SERVICE      | SERVICE I/O Bank Supply                    |
| AH33   | RST_HARD_N         | Chip Reset                                 |
| AH34   | SOC_DDR_VDDIO      | SOC DDR I/O Bank 1.2V, 1.5V or 1.8V Supply |
| AH35   | SOC_DDR_DQSP4      | SOC DDR                                    |
| AH36   | SOC_DDR_DQ32       | SOC DDR                                    |
| AH37   | SOC_DDR_DQ33       | SOC DDR                                    |
| AH38   | SOC_DDR_DQSN3      | SOC DDR                                    |
| AH39   | SOC_DDR_DQSP3      | SOC DDR                                    |
| AH40   | SOC_DDR_DQ34       | SOC DDR                                    |
| AH41   | SOC_DDR_A13        | SOC DDR                                    |
| AH42   | SOC_DDR_DQSP15_CKP | SOC DDR                                    |
| AJ1    | GND                | Internal GND Plane                         |
| AJ2    | GND                | Internal GND Plane                         |
| AJ3    | HSSL2_TX0_N        | HSSL2 TX0 Channel                          |
| AJ4    | HSSL2_TX0_P        | HSSL2 TX0 Channel                          |
| AJ5    | GND                | Internal GND Plane                         |
| AJ6    | GND                | Internal GND Plane                         |
| AJ7    | HSSL2_RX0_N        | HSSL2 RX0 Channel                          |
| AJ8    | HSSL2_RX0_P        | HSSL2 RX0 Channel                          |
| AJ9    | GND                | Internal GND Plane                         |
| AJ10   | HSSL2_CALIBRATE    | HSSL2 TX/RX Termination Calibration        |
| AJ11   | GND                | Internal GND Plane                         |
| AJ12   | VDDCORE            | Internal VDD 1.0V Plane                    |
| AJ13   | GND                | Internal GND Plane                         |
| AJ14   | VDDCORE            | Internal VDD 1.0V Plane                    |

| Ball # | Pad Name      | Description                                |
|--------|---------------|--------------------------------------------|
| AJ15   | GND           | Internal GND Plane                         |
| AJ16   | VDDCORE       | Internal VDD 1.0V Plane                    |
| AJ17   | GND           | Internal GND Plane                         |
| AJ18   | VDDCORE       | Internal VDD 1.0V Plane                    |
| AJ19   | GND           | Internal GND Plane                         |
| AJ20   | VDDCORE       | Internal VDD 1.0V Plane                    |
| AJ21   | GND           | Internal GND Plane                         |
| AJ22   | VDDCORE       | Internal VDD 1.0V Plane                    |
| AJ23   | GND           | Internal GND Plane                         |
| AJ24   | VDDCORE       | Internal VDD 1.0V Plane                    |
| AJ25   | GND           | Internal GND Plane                         |
| AJ26   | VDDCORE       | Internal VDD 1.0V Plane                    |
| AJ27   | GND           | Internal GND Plane                         |
| AJ28   | VDDCORE       | Internal VDD 1.0V Plane                    |
| AJ29   | GND           | Internal GND Plane                         |
| AJ30   | VDDCORE       | Internal VDD 1.0V Plane                    |
| AJ31   | MODE1         | Chip Mode Input                            |
| AJ32   | GND           | Internal GND Plane                         |
| AJ33   | POK           | Power OK                                   |
| AJ34   | GND           | Internal GND Plane                         |
| AJ35   | GND           | Internal GND Plane                         |
| AJ36   | SOC_DDR_DQ31  | SOC DDR                                    |
| AJ37   | SOC_DDR_DQ30  | SOC DDR                                    |
| AJ38   | SOC_DDR_VDDIO | SOC DDR I/O Bank 1.2V, 1.5V or 1.8V Supply |
| AJ39   | SOC_DDR_DM3   | SOC DDR                                    |
| AJ40   | SOC_DDR_DQ29  | SOC DDR                                    |
| AJ41   | GND           | Internal GND Plane                         |
| AJ42   | SOC_DDR_CSN   | SOC DDR                                    |
| AK1    | HSSL1_TX3_N   | HSSL1 TX3 Channel                          |
| AK2    | HSSL1_TX3_P   | HSSL1 TX3 Channel                          |
| AK3    | GND           | Internal GND Plane                         |
| AK4    | HSSL1_VDDA    | HSSL1 TX Driver 1.0V Analog Supply         |
| AK5    | HSSL1_RX3_N   | HSSL1 RX3 Channel                          |
| AK6    | HSSL1_RX3_P   | HSSL1 RX3 Channel                          |
| AK7    | GND           | Internal GND Plane                         |
| AK8    | HSSL1_VDD1V8A | HSSL1 RX/TX 1.8V Analog Supply             |
| AK9    | GND           | Internal GND Plane                         |
| AK10   | HSSL1_D_VDD   | HSSL1 1.0V Digital Supply                  |
| AK11   | GND           | Internal GND Plane                         |
| AK12   | GND           | Internal GND Plane                         |
| AK13   | VDDCORE       | Internal VDD 1.0V Plane                    |
| AK14   | GND           | Internal GND Plane                         |
| AK15   | VDDCORE       | Internal VDD 1.0V Plane                    |
| AK16   | GND           | Internal GND Plane                         |

| Ball # | Pad Name        | Description                        |
|--------|-----------------|------------------------------------|
| AK17   | VDDCORE         | Internal VDD 1.0V Plane            |
| AK18   | GND             | Internal GND Plane                 |
| AK19   | VDDCORE         | Internal VDD 1.0V Plane            |
| AK20   | GND             | Internal GND Plane                 |
| AK21   | VDDCORE         | Internal VDD 1.0V Plane            |
| AK22   | GND             | Internal GND Plane                 |
| AK23   | VDDCORE         | Internal VDD 1.0V Plane            |
| AK24   | GND             | Internal GND Plane                 |
| AK25   | VDDCORE         | Internal VDD 1.0V Plane            |
| AK26   | GND             | Internal GND Plane                 |
| AK27   | VDDCORE         | Internal VDD 1.0V Plane            |
| AK28   | GND             | Internal GND Plane                 |
| AK29   | VDDCORE         | Internal VDD 1.0V Plane            |
| AK30   | ID0             | Bitstream Identification           |
| AK31   | ID1             | Bitstream Identification           |
| AK32   | ID2             | Bitstream Identification           |
| AK33   | ID3             | Bitstream Identification           |
| AK34   | CKGEN6_PLL_VDDA | CKGEN6 PLL 1V Analog Supply        |
| AK35   | SOC_DDR_DM2     | SOC DDR                            |
| AK36   | SOC_DDR_DQSP2   | SOC DDR                            |
| AK37   | SOC_DDR_DQ28    | SOC DDR                            |
| AK38   | SOC_DDR_DQ27    | SOC DDR                            |
| AK39   | SOC_DDR_DQ26    | SOC DDR                            |
| AK40   | SOC_DDR_DQ25    | SOC DDR                            |
| AK41   | SOC_DDR_A12     | SOC DDR                            |
| AK42   | SOC_DDR_CKE     | SOC DDR                            |
| AL1    | GND             | Internal GND Plane                 |
| AL2    | GND             | Internal GND Plane                 |
| AL3    | HSSL1_TX2_N     | HSSL1 TX2 Channel                  |
| AL4    | HSSL1_TX2_P     | HSSL1 TX2 Channel                  |
| AL5    | GND             | Internal GND Plane                 |
| AL6    | GND             | Internal GND Plane                 |
| AL7    | HSSL1_RX2_N     | HSSL1 RX2 Channel                  |
| AL8    | HSSL1_RX2_P     | HSSL1 RX2 Channel                  |
| AL9    | HSSL1_CKREF_P   | HSSL1 Differential Reference Clock |
| AL10   | HSSL1_D_VDD     | HSSL1 1.0V Digital Supply          |
| AL11   | GND             | Internal GND Plane                 |
| AL12   | IO_B02D06_N     | Complex Bank02 I/O                 |
| AL13   | GND             | Internal GND Plane                 |
| AL14   | IO_B02D06_P     | Complex Bank02 I/O                 |
| AL15   | IO_B02D04_N     | Complex Bank02 I/O                 |
| AL16   | IO_B02_VDDIO    | Bank02 I/O Supply                  |
| AL17   | IO_B00D06       | Direct Bank00 I/O                  |
| AL18   | IO_B00D07       | Direct Bank00 I/O                  |

| Ball # | Pad Name        | Description                        |
|--------|-----------------|------------------------------------|
| AL19   | IO_B00_VDDIO    | Bank00 I/O Supply                  |
| AL20   | IO_B00D14       | Direct Bank00 I/O                  |
| AL21   | IO_B00D15       | Direct Bank00 I/O                  |
| AL22   | IO_B00D16       | Direct Bank00 I/O                  |
| AL23   | IO_B00D17       | Direct Bank00 I/O                  |
| AL24   | IO_B00_VDDIO    | Bank00 I/O Supply                  |
| AL25   | CS              | Slave Parallel16                   |
| AL26   | TYPE0           | Slave Parallel16                   |
| AL27   | TYPE1           | Slave Parallel16                   |
| AL28   | DATA_OE         | Slave Parallel16                   |
| AL29   | USER1           | Direct Connection with Fabric      |
| AL30   | USER2           | Direct Connection with Fabric      |
| AL31   | VDDIO_SERVICE   | SERVICE I/O Bank Supply            |
| AL32   | USER3           | Direct Connection with Fabric      |
| AL33   | USER4           | Direct Connection with Fabric      |
| AL34   | CKGEN6_PLL_VDDA | CKGEN6 PLL 1V Analog Supply        |
| AL35   | SOC_DDR_DQSN2   | SOC DDR                            |
| AL36   | SOC_DDR_DQ20    | SOC DDR                            |
| AL37   | SOC_DDR_DQ21    | SOC DDR                            |
| AL38   | SOC_DDR_DQ22    | SOC DDR                            |
| AL39   | SOC_DDR_DQ23    | SOC DDR                            |
| AL40   | SOC_DDR_DQ24    | SOC DDR                            |
| AL41   | SOC_DDR_A11     | SOC DDR                            |
| AL42   | SOC_DDR_A0      | SOC DDR                            |
| AM1    | HSSL1_TX1_N     | HSSL1 TX1 Channel                  |
| AM2    | HSSL1_TX1_P     | HSSL1 TX1 Channel                  |
| AM3    | GND             | Internal GND Plane                 |
| AM4    | HSSL1_VDDA      | HSSL1 TX Driver 1.0V Analog Supply |
| AM5    | HSSL1_RX1_N     | HSSL1 RX1 Channel                  |
| AM6    | HSSL1_RX1_P     | HSSL1 RX1 Channel                  |
| AM7    | GND             | Internal GND Plane                 |
| AM8    | HSSL1_VDD1V8A   | HSSL1 RX/TX 1.8V Analog Supply     |
| AM9    | HSSL1_CKREF_N   | HSSL1 Differential Reference Clock |
| AM10   | HSSL1_D_VDD     | HSSL1 1.0V Digital Supply          |
| AM11   | GND             | Internal GND Plane                 |
| AM12   | IO_B02D07_N     | Complex Bank02 I/O                 |
| AM13   | IO_B02D07_P     | Complex Bank02 I/O                 |
| AM14   | IO_B02D05_N     | Complex Bank02 I/O                 |
| AM15   | IO_B02D05_P     | Complex Bank02 I/O                 |
| AM16   | IO_B02D04_P     | Complex Bank02 I/O                 |
| AM17   | GND             | Internal GND Plane                 |
| AM18   | IO_B00D04       | Direct Bank00 I/O                  |
| AM19   | IO_B00D05       | Direct Bank00 I/O                  |
| AM20   | IO_B00D12       | Direct Bank00 I/O                  |

| Ball # | Pad Name           | Description                                |
|--------|--------------------|--------------------------------------------|
| AM21   | IO_B00D13          | Direct Bank00 I/O                          |
| AM22   | GND                | Internal GND Plane                         |
| AM23   | IO_B00D18          | Direct Bank00 I/O                          |
| AM24   | IO_B00D19          | Direct Bank00 I/O                          |
| AM25   | D13                | Slave Parallel16                           |
| AM26   | VDDIO_SERVICE      | SERVICE I/O Bank Supply                    |
| AM27   | D14                | Slave Parallel16                           |
| AM28   | D15                | Slave Parallel16                           |
| AM29   | USER0              | Direct Connection with Fabric              |
| AM30   | TCK                | JTAG                                       |
| AM31   | TDI                | JTAG                                       |
| AM32   | TDO                | JTAG                                       |
| AM33   | TRST               | JTAG                                       |
| AM34   | CKGEN6_PLL_VDD1V8A | CKGEN6 PLL 1.8V Analog Supply              |
| AM35   | SOC_DDR_VDDIO      | SOC DDR I/O Bank 1.2V, 1.5V or 1.8V Supply |
| AM36   | SOC_DDR_DQ19       | SOC DDR                                    |
| AM37   | SOC_DDR_DQ18       | SOC DDR                                    |
| AM38   | GND                | Internal GND Plane                         |
| AM39   | SOC_DDR_DM1        | SOC DDR                                    |
| AM40   | SOC_DDR_A1         | SOC DDR                                    |
| AM41   | SOC_DDR_VDDIO      | SOC DDR I/O Bank 1.2V, 1.5V or 1.8V Supply |
| AM42   | SOC_DDR_CKP        | SOC DDR                                    |
| AN1    | GND                | Internal GND Plane                         |
| AN2    | GND                | Internal GND Plane                         |
| AN3    | HSSL1_TX0_N        | HSSL1 TX0 Channel                          |
| AN4    | HSSL1_TX0_P        | HSSL1 TX0 Channel                          |
| AN5    | GND                | Internal GND Plane                         |
| AN6    | GND                | Internal GND Plane                         |
| AN7    | HSSL1_RX0_N        | HSSL1 RX0 Channel                          |
| AN8    | HSSL1_RX0_P        | HSSL1 RX0 Channel                          |
| AN9    | GND                | Internal GND Plane                         |
| AN10   | HSSL1_CALIBRATE    | HSSL1 TX/RX Termination Calibration        |
| AN11   | GND                | Internal GND Plane                         |
| AN12   | IO_B02D08_N        | Complex Bank02 I/O                         |
| AN13   | IO_B02_VDDIO       | Bank02 I/O Supply                          |
| AN14   | IO_B02D10_N        | Complex Bank02 I/O                         |
| AN15   | IO_B02D11_N        | Complex Bank02 I/O                         |
| AN16   | GND                | Internal GND Plane                         |
| AN17   | IO_B00D00          | Direct Bank00 I/O                          |
| AN18   | IO_B00D02          | Direct Bank00 I/O                          |
| AN19   | IO_B00D03          | Direct Bank00 I/O                          |
| AN20   | IO_B00D10          | Direct Bank00 I/O                          |
| AN21   | IO_B00D11          | Direct Bank00 I/O                          |
| AN22   | IO_B00D20          | Direct Bank00 I/O                          |

| Ball # | Pad Name           | Description                                |
|--------|--------------------|--------------------------------------------|
| AN23   | IO_B00D21          | Direct Bank00 I/O                          |
| AN24   | IO_B00D22          | Direct Bank00 I/O                          |
| AN25   | D8                 | Slave Parallel16                           |
| AN26   | D9                 | Slave Parallel16                           |
| AN27   | GND                | Internal GND Plane                         |
| AN28   | D10                | Slave Parallel16                           |
| AN29   | D11                | Slave Parallel16                           |
| AN30   | D12                | Slave Parallel16                           |
| AN31   | GND                | Internal GND Plane                         |
| AN32   | TMS                | JTAG                                       |
| AN33   | CLK_OSC            | Clock Oscillator from Bitstream Manager    |
| AN34   | CKGEN6_PLL_VDD1V8A | CKGEN6 PLL 1.8V Analog Supply              |
| AN35   | SOC_DDR_VDDIO      | SOC DDR I/O Bank 1.2V, 1.5V or 1.8V Supply |
| AN36   | SOC_DDR_DQ17       | SOC DDR                                    |
| AN37   | SOC_DDR_DQSP1      | SOC DDR                                    |
| AN38   | SOC_DDR_DQ15       | SOC DDR                                    |
| AN39   | SOC_DDR_DQ14       | SOC DDR                                    |
| AN40   | SOC_DDR_DQ13       | SOC DDR                                    |
| AN41   | SOC_DDR_A10        | SOC DDR                                    |
| AN42   | SOC_DDR_CKN        | SOC DDR                                    |
| AP1    | HSSL0_TX3_N        | HSSL0 TX3 Channel                          |
| AP2    | HSSL0_TX3_P        | HSSL0 TX3 Channel                          |
| AP3    | GND                | Internal GND Plane                         |
| AP4    | HSSL0_VDDA         | HSSL0 TX Driver 1.0V Analog Supply         |
| AP5    | HSSL0_RX3_N        | HSSL0 RX3 Channel                          |
| AP6    | HSSL0_RX3_P        | HSSL0 RX3 Channel                          |
| AP7    | GND                | Internal GND Plane                         |
| AP8    | HSSL0_VDD1V8A      | HSSL0 RX/TX 1.8V Analog Supply             |
| AP9    | GND                | Internal GND Plane                         |
| AP10   | HSSL0_D_VDD        | HSSL0 1.0V Digital Supply                  |
| AP11   | GND                | Internal GND Plane                         |
| AP12   | IO_B02D08_P_CLK    | Complex Bank02 I/O                         |
| AP13   | IO_B02D09_N        | Complex Bank02 I/O                         |
| AP14   | IO_B02D09_P_CLK    | Complex Bank02 I/O                         |
| AP15   | IO_B02D10_P        | Complex Bank02 I/O                         |
| AP16   | IO_B02D11_P        | Complex Bank02 I/O                         |
| AP17   | IO_B00_VDDIO       | Bank00 I/O Supply                          |
| AP18   | IO_B00D01          | Direct Bank00 I/O                          |
| AP19   | GND                | Internal GND Plane                         |
| AP20   | IO_B00D08          | Direct Bank00 I/O                          |
| AP21   | IO_B00D09          | Direct Bank00 I/O                          |
| AP22   | IO_B00_VDDIO       | Bank00 I/O Supply                          |
| AP23   | IO_B00D23          | Direct Bank00 I/O                          |
| AP24   | GND                | Internal GND Plane                         |

| Ball # | Pad Name         | Description                              |
|--------|------------------|------------------------------------------|
| AP25   | D0               | Slave Parallel16                         |
| AP26   | D1               | Slave Parallel16                         |
| AP27   | D2               | Slave Parallel16                         |
| AP28   | D3               | Slave Parallel16                         |
| AP29   | D4               | Slave Parallel16                         |
| AP30   | D5               | Slave Parallel16                         |
| AP31   | D6               | Slave Parallel16                         |
| AP32   | D7               | Slave Parallel16                         |
| AP33   | CLK_BSM          | Bitstream Manager Clock                  |
| AP34   | GND              | Internal GND Plane                       |
| AP35   | GND              | Internal GND Plane                       |
| AP36   | SOC_DDR_DQ16     | SOC DDR                                  |
| AP37   | SOC_DDR_DQSN1    | SOC DDR                                  |
| AP38   | SOC_DDR_DQ10     | SOC DDR                                  |
| AP39   | SOC_DDR_DQ11     | SOC DDR                                  |
| AP40   | SOC_DDR_DQ12     | SOC DDR                                  |
| AP41   | SOC_DDR_A9       | SOC DDR                                  |
| AP42   | SOC_DDR_A2       | SOC DDR                                  |
| AR1    | GND              | Internal GND Plane                       |
| AR2    | GND              | Internal GND Plane                       |
| AR3    | HSSL0_TX2_N      | HSSL0 TX2 Channel                        |
| AR4    | HSSL0_TX2_P      | HSSL0 TX2 Channel                        |
| AR5    | GND              | Internal GND Plane                       |
| AR6    | GND              | Internal GND Plane                       |
| AR7    | HSSL0_RX2_N      | HSSL0 RX2 Channel                        |
| AR8    | HSSL0_RX2_P      | HSSL0 RX2 Channel                        |
| AR9    | HSSL0_CKREF_P    | HSSL0 Differential Reference Clock       |
| AR10   | HSSL0_D_VDD      | HSSL0 1.0V Digital Supply                |
| AR11   | GND              | Internal GND Plane                       |
| AR12   | IO_B02D01_N_SWO  | Complex Bank02 I/O / SpaceWire Tx Module |
| AR13   | IO_B02D00_N_SWDO | Complex Bank02 I/O / SpaceWire Tx Module |
| AR14   | IO_B02D00_P_SWDO | Complex Bank02 I/O / SpaceWire Tx Module |
| AR15   | IO_B02D12_N      | Complex Bank02 I/O                       |
| AR16   | IO_B02D12_P      | Complex Bank02 I/O                       |
| AR17   | IO_B01D06        | Direct Bank01 I/O                        |
| AR18   | IO_B01D07        | Direct Bank01 I/O                        |
| AR19   | IO_B01_VDDIO     | Bank01 I/O Supply                        |
| AR20   | IO_B01D14        | Direct Bank01 I/O                        |
| AR21   | IO_B01D15        | Direct Bank01 I/O                        |
| AR22   | IO_B01D16        | Direct Bank01 I/O                        |
| AR23   | IO_B01D17        | Direct Bank01 I/O                        |
| AR24   | IO_B01_VDDIO     | Bank01 I/O Supply                        |
| AR25   | IO_B12_VDDIO     | Bank12 I/O Supply                        |
| AR26   | IO_B12D03_N_SWI  | Complex Bank12 I/O                       |

| Ball # | Pad Name         | Description                                |
|--------|------------------|--------------------------------------------|
| AR27   | GND              | Internal GND Plane                         |
| AR28   | IO_B12D05_N      | Complex Bank12 I/O                         |
| AR29   | IO_B12D05_P      | Complex Bank12 I/O                         |
| AR30   | IO_B12_VDDIO     | Bank12 I/O Supply                          |
| AR31   | IO_B12D08_N      | Complex Bank12 I/O                         |
| AR32   | IO_B12D08_P_CLK  | Complex Bank12 I/O                         |
| AR33   | GND              | Internal GND Plane                         |
| AR34   | IO_B12D16_N_SWIS | Complex Bank12 I/O / SpaceWire Rx Module   |
| AR35   | IO_B12D16_P_SWIS | Complex Bank12 I/O / SpaceWire Rx Module   |
| AR36   | IO_B12_VDDIO     | Bank12 I/O Supply                          |
| AR37   | SOC_DDR_DQSP0    | SOC DDR                                    |
| AR38   | SOC_DDR_VDDIO    | SOC DDR I/O Bank 1.2V, 1.5V or 1.8V Supply |
| AR39   | SOC_DDR_DQ8      | SOC DDR                                    |
| AR40   | SOC_DDR_DQ9      | SOC DDR                                    |
| AR41   | GND              | Internal GND Plane                         |
| AR42   | SOC_DDR_A3       | SOC DDR                                    |
| AT1    | HSSL0_TX1_N      | HSSL0 TX1 Channel                          |
| AT2    | HSSL0_TX1_P      | HSSL0 TX1 Channel                          |
| AT3    | GND              | Internal GND Plane                         |
| AT4    | HSSL0_VDDA       | HSSL0 TX Driver 1.0V Analog Supply         |
| AT5    | HSSL0_RX1_N      | HSSL0 RX1 Channel                          |
| AT6    | HSSL0_RX1_P      | HSSL0 RX1 Channel                          |
| AT7    | GND              | Internal GND Plane                         |
| AT8    | HSSL0_VDD1V8A    | HSSL0 RX/TX 1.8V Analog Supply             |
| AT9    | HSSL0_CKREF_N    | HSSL0 Differential Reference Clock         |
| AT10   | HSSL0_D_VDD      | HSSL0 1.0V Digital Supply                  |
| AT11   | GND              | Internal GND Plane                         |
| AT12   | IO_B02D01_P_SWIS | Complex Bank02 I/O / SpaceWire Tx Module   |
| AT13   | GND              | Internal GND Plane                         |
| AT14   | IO_B02D02_N_SWIS | Complex Bank02 I/O / SpaceWire Rx Module   |
| AT15   | IO_B02D13_N_SWIS | Complex Bank02 I/O / SpaceWire Tx Module   |
| AT16   | IO_B02_VDDIO     | Bank02 I/O Supply                          |
| AT17   | GND              | Internal GND Plane                         |
| AT18   | IO_B01D04        | Direct Bank01 I/O                          |
| AT19   | IO_B01D05        | Direct Bank01 I/O                          |
| AT20   | IO_B01D12        | Direct Bank01 I/O                          |
| AT21   | IO_B01D13        | Direct Bank01 I/O                          |
| AT22   | GND              | Internal GND Plane                         |
| AT23   | IO_B01D18        | Direct Bank01 I/O                          |
| AT24   | IO_B01D19        | Direct Bank01 I/O                          |
| AT25   | IO_B12D02_N_SWIS | Complex Bank12 I/O / SpaceWire Rx Module   |
| AT26   | IO_B12D02_P_SWIS | Complex Bank12 I/O / SpaceWire Rx Module   |
| AT27   | IO_B12D03_P_SWIS | Complex Bank12 I/O / SpaceWire Rx Module   |
| AT28   | IO_B12D06_N      | Complex Bank12 I/O                         |

| Ball # | Pad Name         | Description                              |
|--------|------------------|------------------------------------------|
| AT29   | IO_B12D06_P      | Complex Bank12 I/O                       |
| AT30   | IO_B12D07_P      | Complex Bank12 I/O                       |
| AT31   | IO_B12D09_N      | Complex Bank12 I/O                       |
| AT32   | IO_B12D09_P_CLK  | Complex Bank12 I/O                       |
| AT33   | IO_B12D13_N_SWDO | Complex Bank12 I/O / SpaceWire Tx Module |
| AT34   | IO_B12D13_P_SWDO | Complex Bank12 I/O / SpaceWire Tx Module |
| AT35   | IO_B12D15_P_SWDI | Complex Bank12 I/O / SpaceWire Rx Module |
| AT36   | IO_B12D14_P_SWSO | Complex Bank12 I/O / SpaceWire Tx Module |
| AT37   | SOC_DDR_DQSN0    | SOC DDR                                  |
| AT38   | SOC_DDR_DQ7      | SOC DDR                                  |
| AT39   | SOC_DDR_DQ6      | SOC DDR                                  |
| AT40   | SOC_DDR_DQ5      | SOC DDR                                  |
| AT41   | SOC_DDR_A8       | SOC DDR                                  |
| AT42   | SOC_DDR_A4       | SOC DDR                                  |
| AU1    | GND              | Internal GND Plane                       |
| AU2    | GND              | Internal GND Plane                       |
| AU3    | HSSL0_TX0_N      | HSSL0 TX0 Channel                        |
| AU4    | HSSL0_TX0_P      | HSSL0 TX0 Channel                        |
| AU5    | GND              | Internal GND Plane                       |
| AU6    | GND              | Internal GND Plane                       |
| AU7    | HSSL0_RX0_N      | HSSL0 RX0 Channel                        |
| AU8    | HSSL0_RX0_P      | HSSL0 RX0 Channel                        |
| AU9    | GND              | Internal GND Plane                       |
| AU10   | HSSL0_CALIBRATE  | HSSL0 TX/RX Termination Calibration      |
| AU11   | GND              | Internal GND Plane                       |
| AU12   | IO_B02D03_N_SWIS | Complex Bank02 I/O / SpaceWire Rx Module |
| AU13   | IO_B02D03_P_SWIS | Complex Bank02 I/O / SpaceWire Rx Module |
| AU14   | IO_B02D02_P_SWDI | Complex Bank02 I/O / SpaceWire Rx Module |
| AU15   | IO_B02D13_P_SWDO | Complex Bank02 I/O / SpaceWire Tx Module |
| AU16   | IO_B02D14_N_SWSO | Complex Bank02 I/O / SpaceWire Tx Module |
| AU17   | IO_B01D00        | Direct Bank01 I/O                        |
| AU18   | IO_B01D02        | Direct Bank01 I/O                        |
| AU19   | IO_B01D03        | Direct Bank01 I/O                        |
| AU20   | IO_B01D10        | Direct Bank01 I/O                        |
| AU21   | IO_B01D11        | Direct Bank01 I/O                        |
| AU22   | IO_B01D20        | Direct Bank01 I/O                        |
| AU23   | IO_B01D21        | Direct Bank01 I/O                        |
| AU24   | IO_B01D22        | Direct Bank01 I/O                        |
| AU25   | IO_B12D00_N_SWDO | Complex Bank12 I/O / SpaceWire Tx Module |
| AU26   | IO_B12D00_P_SWDO | Complex Bank12 I/O / SpaceWire Tx Module |
| AU27   | IO_B12_VDDIO     | Bank12 I/O Supply                        |
| AU28   | IO_B12D04_P      | Complex Bank12 I/O                       |
| AU29   | IO_B12D07_N      | Complex Bank12 I/O                       |
| AU30   | GND              | Internal GND Plane                       |

| Ball # | Pad Name         | Description                              |
|--------|------------------|------------------------------------------|
| AU31   | IO_B12D10_N      | Complex Bank12 I/O                       |
| AU32   | IO_B12D10_P      | Complex Bank12 I/O                       |
| AU33   | IO_B12_VDDIO     | Bank12 I/O Supply                        |
| AU34   | IO_B12D15_N_SWDI | Complex Bank12 I/O / SpaceWire Rx Module |
| AU35   | IO_B12D14_N_SWSO | Complex Bank12 I/O / SpaceWire Tx Module |
| AU36   | GND              | Internal GND Plane                       |
| AU37   | SOC_DDR_DM0      | SOC DDR                                  |
| AU38   | SOC_DDR_DQ2      | SOC DDR                                  |
| AU39   | SOC_DDR_DQ3      | SOC DDR                                  |
| AU40   | SOC_DDR_DQ4      | SOC DDR                                  |
| AU41   | SOC_DDR_A7       | SOC DDR                                  |
| AU42   | SOC_DDR_A5       | SOC DDR                                  |
| AV1    | GND              | Internal GND Plane                       |
| AV2    | GND              | Internal GND Plane                       |
| AV3    | GND              | Internal GND Plane                       |
| AV4    | GND              | Internal GND Plane                       |
| AV5    | GND              | Internal GND Plane                       |
| AV6    | GND              | Internal GND Plane                       |
| AV7    | GND              | Internal GND Plane                       |
| AV8    | GND              | Internal GND Plane                       |
| AV9    | GND              | Internal GND Plane                       |
| AV10   | GND              | Internal GND Plane                       |
| AV11   | GND              | Internal GND Plane                       |
| AV12   | IO_B02_VTO       | Bank02 Termination Voltage               |
| AV13   | IO_B02_VTO       | Bank02 Termination Voltage               |
| AV14   | IO_B02_VTO       | Bank02 Termination Voltage               |
| AV15   | IO_B02_VDDIO     | Bank02 I/O Supply                        |
| AV16   | IO_B02D14_P_SWSO | Complex Bank02 I/O / SpaceWire Tx Module |
| AV17   | IO_B01_VDDIO     | Bank01 I/O Supply                        |
| AV18   | IO_B01D01        | Direct Bank01 I/O                        |
| AV19   | GND              | Internal GND Plane                       |
| AV20   | IO_B01D08        | Direct Bank01 I/O                        |
| AV21   | IO_B01D09        | Direct Bank01 I/O                        |
| AV22   | IO_B01_VDDIO     | Bank01 I/O Supply                        |
| AV23   | IO_B01D23        | Direct Bank01 I/O                        |
| AV24   | GND              | Internal GND Plane                       |
| AV25   | GND              | Internal GND Plane                       |
| AV26   | IO_B12D01_N_SWSO | Complex Bank12 I/O / SpaceWire Tx Module |
| AV27   | IO_B12D04_N      | Complex Bank12 I/O                       |
| AV28   | IO_B13_VTO       | Bank13 Termination Voltage               |
| AV29   | IO_B12_VTO       | Bank12 Termination Voltage               |
| AV30   | IO_B12_VTO       | Bank12 Termination Voltage               |
| AV31   | IO_B12_VDDS      | Bank12 Termination Switch Supply         |
| AV32   | IO_B12D11_N      | Complex Bank12 I/O                       |

| Ball # | Pad Name           | Description                                |
|--------|--------------------|--------------------------------------------|
| AV33   | IO_B12D11_P        | Complex Bank12 I/O                         |
| AV34   | IO_B12D12_N        | Complex Bank12 I/O                         |
| AV35   | IO_B12D12_P        | Complex Bank12 I/O                         |
| AV36   | IO_B11D08_N        | Complex Bank12 I/O                         |
| AV37   | GND                | Internal GND Plane                         |
| AV38   | GND                | Internal GND Plane                         |
| AV39   | SOC_DDR_DQ1        | SOC DDR                                    |
| AV40   | SOC_DDR_DQ0        | SOC DDR                                    |
| AV41   | SOC_DDR_VDDIO      | SOC DDR I/O Bank 1.2V, 1.5V or 1.8V Supply |
| AV42   | SOC_DDR_A6         | SOC DDR                                    |
| AW1    | CKGEN1_PLL_VDD1V8A | CKGEN1 PLL 1.8V Analog Supply              |
| AW2    | CKGEN1_PLL_VDDA    | CKGEN1 PLL 1V Analog Supply                |
| AW3    | GND                | Internal GND Plane                         |
| AW4    | IO_B03D11_N        | Complex Bank03 I/O                         |
| AW5    | IO_B03D11_P        | Complex Bank03 I/O                         |
| AW6    | IO_B03_VDDIO       | Bank03 I/O Supply                          |
| AW7    | IO_B03D09_N        | Complex Bank03 I/O                         |
| AW8    | IO_B03D09_P_CLK    | Complex Bank03 I/O                         |
| AW9    | GND                | Internal GND Plane                         |
| AW10   | IO_B03D06_P        | Complex Bank03 I/O                         |
| AW11   | IO_B03_VDDIO       | Bank03 I/O Supply                          |
| AW12   | IO_B03_VTO         | Bank03 Termination Voltage                 |
| AW13   | IO_B03_VTO         | Bank03 Termination Voltage                 |
| AW14   | IO_B03_VTO         | Bank03 Termination Voltage                 |
| AW15   | IO_B02_VDDS        | Bank02 Termination Switch Supply           |
| AW16   | GND                | Internal GND Plane                         |
| AW17   | IO_B13D03_N_SWIS   | Complex Bank13 I/O / SpaceWire Rx Module   |
| AW18   | IO_B13D03_P_SWIS   | Complex Bank13 I/O / SpaceWire Rx Module   |
| AW19   | IO_B13D05_N        | Complex Bank13 I/O                         |
| AW20   | IO_B13D05_P        | Complex Bank13 I/O                         |
| AW21   | IO_B13D06_N        | Complex Bank13 I/O                         |
| AW22   | IO_B13D06_P        | Complex Bank13 I/O                         |
| AW23   | IO_B13D08_N        | Complex Bank13 I/O                         |
| AW24   | IO_B13D08_P_CLK    | Complex Bank13 I/O                         |
| AW25   | GND                | Internal GND Plane                         |
| AW26   | IO_B13D16_N_SWIS   | Complex Bank13 I/O / SpaceWire Rx Module   |
| AW27   | IO_B12D01_P_SWIS   | Complex Bank12 I/O / SpaceWire Tx Module   |
| AW28   | IO_B13_VTO         | Bank13 Termination Voltage                 |
| AW29   | IO_B11_VTO         | Bank11 Termination Voltage                 |
| AW30   | IO_B12_VTO         | Bank12 Termination Voltage                 |
| AW31   | IO_B11_VDDS        | Bank11 Termination Switch Supply           |
| AW32   | IO_B11_VDDIO       | Bank11 I/O Supply                          |
| AW33   | IO_B11D05_N        | Complex Bank11 I/O                         |
| AW34   | IO_B11D05_P        | Complex Bank11 I/O                         |

| Ball # | Pad Name           | Description                              |
|--------|--------------------|------------------------------------------|
| AW35   | IO_B11D06_N        | Complex Bank11 I/O                       |
| AW36   | IO_B11D06_P        | Complex Bank11 I/O                       |
| AW37   | IO_B11D08_P_CLK    | Complex Bank11 I/O                       |
| AW38   | IO_B11D15_N_SWDI   | Complex Bank11 I/O / SpaceWire Rx Module |
| AW39   | IO_B11D16_N_SWSI   | Complex Bank11 I/O / SpaceWire Rx Module |
| AW40   | IO_B11D16_P_SWSI   | Complex Bank11 I/O / SpaceWire Rx Module |
| AW41   | CKGEN0_PLL_VDDA    | CKGEN0 PLL 1V Analog Supply              |
| AW42   | CKGEN0_PLL_VDD1V8A | CKGEN0 PLL 1.8V Analog Supply            |
| AY1    | GND                | Internal GND Plane                       |
| AY2    | CKGEN1_PLL_VDD1V8A | CKGEN1 PLL 1.8V Analog Supply            |
| AY3    | IO_B03D12_N        | Complex Bank03 I/O                       |
| AY4    | IO_B03D12_P        | Complex Bank03 I/O                       |
| AY5    | IO_B03D10_N        | Complex Bank03 I/O                       |
| AY6    | IO_B03D10_P        | Complex Bank03 I/O                       |
| AY7    | IO_B03D08_N        | Complex Bank03 I/O                       |
| AY8    | IO_B03D08_P_CLK    | Complex Bank03 I/O                       |
| AY9    | IO_B03D06_N        | Complex Bank03 I/O                       |
| AY10   | IO_B03D05_N        | Complex Bank03 I/O                       |
| AY11   | IO_B03D05_P        | Complex Bank03 I/O                       |
| AY12   | IO_B03D04_N        | Complex Bank03 I/O                       |
| AY13   | IO_B03D04_P        | Complex Bank03 I/O                       |
| AY14   | IO_B03_VDDS        | Bank03 Termination Switch Supply         |
| AY15   | IO_B02D15_N_SWDI   | Complex Bank02 I/O / SpaceWire Rx Module |
| AY16   | IO_B02D15_P_SWDI   | Complex Bank02 I/O / SpaceWire Rx Module |
| AY17   | IO_B13_VDDIO       | Bank13 I/O Supply                        |
| AY18   | IO_B13D02_N_SWDI   | Complex Bank13 I/O / SpaceWire Rx Module |
| AY19   | IO_B13D02_P_SWDI   | Complex Bank13 I/O / SpaceWire Rx Module |
| AY20   | GND                | Internal GND Plane                       |
| AY21   | IO_B13D07_N        | Complex Bank13 I/O                       |
| AY22   | IO_B13D07_P        | Complex Bank13 I/O                       |
| AY23   | IO_B13_VDDIO       | Bank13 I/O Supply                        |
| AY24   | IO_B13D13_N_SWDO   | Complex Bank13 I/O / SpaceWire Tx Module |
| AY25   | IO_B13D13_P_SWDO   | Complex Bank13 I/O / SpaceWire Tx Module |
| AY26   | IO_B13D15_N_SWDI   | Complex Bank13 I/O / SpaceWire Rx Module |
| AY27   | IO_B13D16_P_SWSI   | Complex Bank13 I/O / SpaceWire Rx Module |
| AY28   | IO_B13_VTO         | Bank13 Termination Voltage               |
| AY29   | IO_B11_VTO         | Bank11 Termination Voltage               |
| AY30   | IO_B11_VTO         | Bank11 Termination Voltage               |
| AY31   | IO_B13_VDDS        | Bank13 Termination Switch Supply         |
| AY32   | IO_B11D03_N_SWSI   | Complex Bank11 I/O / SpaceWire Rx Module |
| AY33   | IO_B11D03_P_SWSI   | Complex Bank11 I/O / SpaceWire Rx Module |
| AY34   | GND                | Internal GND Plane                       |
| AY35   | IO_B11D07_N        | Complex Bank11 I/O                       |
| AY36   | IO_B11D07_P        | Complex Bank11 I/O                       |

| Ball # | Pad Name           | Description                              |
|--------|--------------------|------------------------------------------|
| AY37   | IO_B11_VDDIO       | Bank11 I/O Supply                        |
| AY38   | IO_B11D15_P_SWDI   | Complex Bank11 I/O / SpaceWire Rx Module |
| AY39   | IO_B11D14_N_SWSO   | Complex Bank11 I/O / SpaceWire Tx Module |
| AY40   | GND                | Internal GND Plane                       |
| AY41   | CKGEN0_PLL_VDD1V8A | CKGEN0 PLL 1.8V Analog Supply            |
| AY42   | GND                | Internal GND Plane                       |
| BA1    | GND                | Internal GND Plane                       |
| BA2    | GND                | Internal GND Plane                       |
| BA3    | IO_B03D15_N_SWDI   | Complex Bank03 I/O / SpaceWire Rx Module |
| BA4    | IO_B03D16_N_SWSI   | Complex Bank03 I/O / SpaceWire Rx Module |
| BA5    | IO_B03D16_P_SWSI   | Complex Bank03 I/O / SpaceWire Rx Module |
| BA6    | GND                | Internal GND Plane                       |
| BA7    | IO_B03D07_N        | Complex Bank03 I/O                       |
| BA8    | IO_B03D07_P        | Complex Bank03 I/O                       |
| BA9    | IO_B03D03_N_SWSI   | Complex Bank03 I/O / SpaceWire Rx Module |
| BA10   | IO_B03D03_P_SWSI   | Complex Bank03 I/O / SpaceWire Rx Module |
| BA11   | GND                | Internal GND Plane                       |
| BA12   | IO_B03D01_N_SWSO   | Complex Bank03 I/O / SpaceWire Tx Module |
| BA13   | IO_B03D01_P_SWSO   | Complex Bank03 I/O / SpaceWire Tx Module |
| BA14   | IO_B03_VDDIO       | Bank03 I/O Supply                        |
| BA15   | IO_B02D16_N_SWSI   | Complex Bank02 I/O / SpaceWire Rx Module |
| BA16   | IO_B02D16_P_SWSI   | Complex Bank02 I/O / SpaceWire Rx Module |
| BA17   | IO_B13D00_N_SWDO   | Complex Bank13 I/O / SpaceWire Tx Module |
| BA18   | IO_B13D00_P_SWDO   | Complex Bank13 I/O / SpaceWire Tx Module |
| BA19   | IO_B13D04_N        | Complex Bank13 I/O                       |
| BA20   | IO_B13D04_P        | Complex Bank13 I/O                       |
| BA21   | IO_B13D09_N        | Complex Bank13 I/O                       |
| BA22   | IO_B13D09_P_CLK    | Complex Bank13 I/O                       |
| BA23   | IO_B13D11_N        | Complex Bank13 I/O                       |
| BA24   | IO_B13D11_P        | Complex Bank13 I/O                       |
| BA25   | IO_B13D14_N_SWSO   | Complex Bank13 I/O / SpaceWire Tx Module |
| BA26   | IO_B13D14_P_SWSO   | Complex Bank13 I/O / SpaceWire Tx Module |
| BA27   | IO_B13D15_P_SWDI   | Complex Bank13 I/O / SpaceWire Rx Module |
| BA28   | GND                | Internal GND Plane                       |
| BA29   | GND                | Internal GND Plane                       |
| BA30   | IO_B11D00_N_SWDO   | Complex Bank11 I/O / SpaceWire Tx Module |
| BA31   | IO_B11D00_P_SWDO   | Complex Bank11 I/O / SpaceWire Tx Module |
| BA32   | IO_B11D02_N_SWDI   | Complex Bank11 I/O / SpaceWire Rx Module |
| BA33   | IO_B11D02_P_SWDI   | Complex Bank11 I/O / SpaceWire Rx Module |
| BA34   | IO_B11D09_N        | Complex Bank11 I/O                       |
| BA35   | IO_B11D09_P_CLK    | Complex Bank11 I/O                       |
| BA36   | IO_B11D11_N        | Complex Bank11 I/O                       |
| BA37   | IO_B11D11_P        | Complex Bank11 I/O                       |
| BA38   | IO_B11D13_N_SWDO   | Complex Bank11 I/O / SpaceWire Tx Module |

| Ball # | Pad Name         | Description                              |
|--------|------------------|------------------------------------------|
| BA39   | IO_B11D13_P_SWDO | Complex Bank11 I/O / SpaceWire Tx Module |
| BA40   | IO_B11D14_P_SWDO | Complex Bank11 I/O / SpaceWire Tx Module |
| BA41   | GND              | Internal GND Plane                       |
| BA42   | GND              | Internal GND Plane                       |
| BB2    | GND              | Internal GND Plane                       |
| BB3    | IO_B03_VDDIO     | Bank03 I/O Supply                        |
| BB4    | IO_B03D15_P_SWDI | Complex Bank03 I/O / SpaceWire Rx Module |
| BB5    | IO_B03D14_N_SWDO | Complex Bank03 I/O / SpaceWire Tx Module |
| BB6    | IO_B03D14_P_SWDO | Complex Bank03 I/O / SpaceWire Tx Module |
| BB7    | IO_B03D13_N_SWDO | Complex Bank03 I/O / SpaceWire Tx Module |
| BB8    | IO_B03D13_P_SWDO | Complex Bank03 I/O / SpaceWire Tx Module |
| BB9    | IO_B03_VDDIO     | Bank03 I/O Supply                        |
| BB10   | IO_B03D02_N_SWDI | Complex Bank03 I/O / SpaceWire Rx Module |
| BB11   | IO_B03D02_P_SWDI | Complex Bank03 I/O / SpaceWire Rx Module |
| BB12   | IO_B03D00_N_SWDO | Complex Bank03 I/O / SpaceWire Tx Module |
| BB13   | IO_B03D00_P_SWDO | Complex Bank03 I/O / SpaceWire Tx Module |
| BB14   | GND              | Internal GND Plane                       |
| BB15   | GND              | Internal GND Plane                       |
| BB16   | IO_B02_VDDIO     | Bank02 I/O Supply                        |
| BB17   | GND              | Internal GND Plane                       |
| BB18   | IO_B13D01_N_SWDO | Complex Bank13 I/O / SpaceWire Tx Module |
| BB19   | IO_B13D01_P_SWDO | Complex Bank13 I/O / SpaceWire Tx Module |
| BB20   | IO_B13_VDDIO     | Bank13 I/O Supply                        |
| BB21   | IO_B13D10_N      | Complex Bank13 I/O                       |
| BB22   | IO_B13D10_P      | Complex Bank13 I/O                       |
| BB23   | GND              | Internal GND Plane                       |
| BB24   | IO_B13D12_N      | Complex Bank13 I/O                       |
| BB25   | IO_B13D12_P      | Complex Bank13 I/O                       |
| BB26   | IO_B13_VDDIO     | Bank13 I/O Supply                        |
| BB27   | IO_B13_VDDIO     | Bank13 I/O Supply                        |
| BB28   | IO_B11_VDDIO     | Bank11 I/O Supply                        |
| BB29   | IO_B11D01_N_SWDO | Complex Bank11 I/O / SpaceWire Tx Module |
| BB30   | IO_B11D01_P_SWDO | Complex Bank11 I/O / SpaceWire Tx Module |
| BB31   | GND              | Internal GND Plane                       |
| BB32   | IO_B11D04_N      | Complex Bank11 I/O                       |
| BB33   | IO_B11D04_P      | Complex Bank11 I/O                       |
| BB34   | IO_B11_VDDIO     | Bank11 I/O Supply                        |
| BB35   | IO_B11D10_N      | Complex Bank11 I/O                       |
| BB36   | IO_B11D10_P      | Complex Bank11 I/O                       |
| BB37   | GND              | Internal GND Plane                       |
| BB38   | IO_B11D12_N      | Complex Bank11 I/O                       |
| BB39   | IO_B11D12_P      | Complex Bank11 I/O                       |
| BB40   | IO_B11_VDDIO     | Bank11 I/O Supply                        |
| BB41   | GND              | Internal GND Plane                       |

### 1.10 ADD-ON COMPONENTS

Capacitors used within the components specified herein shall be as specified in the Manufacturer's PID and meet the requirements of the ESCC Generic Specification.

### 1.11 MATERIALS AND FINISHES

The component is a Cavity Packaged Flip-Chip Component.

Materials and finishes shall be as follows:

#### (a) Case

The case shall comprise the following materials:

- Organic substrate: Copper based layer, OSP (organic solderability preservatives) finishing on solder ball pads, and SoP (solder-on-pad) finishing on Flip-Chip pads.
- Thermal interface material: Silicon thermal grease
- Heat-spreader/Lid: Copper based, Nickel finishing
- Underfill material: Epoxy

The glass transition temperature of the case materials shall be as follows:

- Thermal interface material: -125°C
- Underfill material: +95 ±15°C (by thermomechanical analysis) or +114 ±5°C (by dynamic mechanical analysis)

**Note:** Internal add-on capacitors have terminals with a pure tin finish.

#### (b) Terminals

The balls are Sn/Pb 63/37.

## 2 REQUIREMENTS

### 2.1 GENERAL

The complete requirements for procurement of the components specified herein are as stated in this specification and the ESCC Generic Specification. Permitted deviations from the Generic Specification, applicable to this specification only, are listed below.

Permitted deviations from the Generic Specification and this Detail Specification, formally agreed with specific Manufacturers on the basis that the alternative requirements are equivalent to the ESCC requirement and do not affect the component's reliability, are listed in the appendices attached to this specification.

#### 2.1.1 Deviations from the Generic Specification

##### 2.1.1.1 *Deviations to Construction, Materials and Finishes*

- (a) Outgassing requirements (ref. ESCC Basic Specification No. [22600](#)): The component has a maximum of 0.12% of collected volatile condensable materials after a 96 hour/+125°C bake.

##### 2.1.1.2 *Deviations from Production Control – Chart F2*

- (a) SEM Inspection: shall not be performed.
- (b) SAM: shall be performed in accordance with [MIL-STD-883, Test Method 2030](#)

### 2.1.1.3 Deviations from Screening Tests – Chart F3

- (a) Radiographic Inspection: shall be performed during Special In-Process Controls (Chart F2) after Underfill, on a sample of 22 components or 10% of the lot, whichever is greater. In the event of a failure, the lot shall be tested 100%. The inspection shall be limited to the mounted add-on Capacitors used within the component.
- (b) High Temperature Reverse Bias Burn-in: shall not be performed.

## 2.2 MARKING

The marking shall be in accordance with the requirements of ESCC Basic Specification No. [21700](#) and as follows.

As a minimum the information to be marked on the component shall be:

- (a) The ESCC qualified components symbol (for ESCC qualified components only).
- (b) The ESCC Component Number (see Para. 1.4.1).
- (c) Traceability information.

## 2.3 ENVIRONMENTAL AND MECHANICAL TESTS

The following requirements apply to tests performed on the component as specified in the ESCC Generic Specification:

- (a) Lid Attach Strength: Lid Pull test shall be performed in accordance with [MIL-STD-883, Test Method 2027](#).
- (b) Temperature-Humidity Test: Only the Unbiased Temperature-Humidity Test shall be performed.
- (c) Add-on Components Die Shear Strength: shall be performed on all the capacitor add-on components.

## 2.4 ELECTRICAL MEASUREMENTS AT ROOM, HIGH AND LOW TEMPERATURES

Electrical measurements shall be performed at room, high and low temperatures. Consolidated notes are given in Para. 2.4.3.

### 2.4.1 Room Temperature Electrical Measurements

The measurements shall be performed at  $T_{amb} = +22 \pm 3 \text{ }^{\circ}\text{C}$ .

| Characteristics                            | Test Conditions | Limits |     | Units |
|--------------------------------------------|-----------------|--------|-----|-------|
|                                            |                 | Min    | Max |       |
| Leakage IIL                                | Note 1          | -5     | 5   | uA    |
| Leakage IIH 1V8                            | Note 1          | -5     | 5   | uA    |
| Leakage IIH 3V3                            | Note 1          | -5     | 5   | uA    |
| Leakage IIL Soc (dahlia)                   | Note 1          | -5     | 5   | uA    |
| Leakage IIH 1V8 Soc (dahlia)               | Note 1          | -5     | 5   | uA    |
| Leakage IIH 3V3 Soc (dahlia)               | Note 1          | -5     | 5   | uA    |
| IDD_stat_reset_consumption VDDCORE_1V0     | Note 1          | -      | 2   | A     |
| IDD_stat_reset_consumption SOC_VDDCORE_1V0 | Note 1          | -      | 0.8 | A     |
| IDD_stat_reset_consumption HSSL_D_VDD_1V0  | Note 1          | -      | 0.8 | A     |
| IDD_stat_reset_consumption IOB_VDDIO_1V8   | Note 1          | -      | 0.8 | A     |

| Characteristics                                | Test Conditions | Limits |        | Units |
|------------------------------------------------|-----------------|--------|--------|-------|
|                                                |                 | Min    | Max    |       |
| IDD_stat_reset_consumption<br>SOC_DDR_VDDIO1V8 | Note 1          | -      | 0.8    | A     |
| IDD_stat_reset_consumption IOB_VDDS_1V8        | Note 1          | -      | 0.8    | A     |
| IDD_stat_reset_consumption<br>SOC_DDR_VDDS_1V8 | Note 1          | -      | 0.8    | A     |
| IDD_stat_reset_consumption<br>SOC_DDR_VTO_0V9  | Note 1          | -      | 0.8    | A     |
| IDD_stat_reset_consumption IOB_VTO_0V9         | Note 1          | -      | 0.8    | A     |
| IDD_stat_reset_consumption<br>CKG_PLL_VDD1V8A  | Note 1          | -      | 0.8    | A     |
| IDD_stat_reset_consumption HSSL_VDD1V8A        | Note 1          | -      | 0.8    | A     |
| IDD_stat_reset_consumption<br>SOC_PLL_VDD1V8   | Note 1          | -      | 0.8    | A     |
| IDD_stat_reset_consumption VDD1V8A             | Note 1          | -      | 0.8    | A     |
| IDD_stat_reset_consumption<br>CKG_PLL_VDDA_1V0 | Note 1          | -      | 0.8    | A     |
| IDD_stat_reset_consumption HSSL_VDDA_1V0       | Note 1          | -      | 0.8    | A     |
| IDD_stat_reset_consumption<br>SOC_PLL_VDDA_1V0 | Note 1          | -      | 0.8    | A     |
| IDD_stat_reset_consumption<br>SBSCAN_VDDIO_3V3 | Note 1          | -      | 0.8    | A     |
| IDD_stat_reset_consumption IOB_VDDIO_3V3       | Note 1          | -      | 0.8    | A     |
| IDD_stat_reset_consumption<br>VDDIO_SERVICE3V3 | Note 1          | -      | 0.8    | A     |
| Functional Test: Go-no-Go VOH 3V3              | Note 1          | Note 1 | Note 1 | -     |
| Functional Test: Go-no-Go VOL 3V3              | Note 1          | Note 1 | Note 1 | -     |
| Functional Test: Go-no-Go VOH 1V8              | Note 1          | Note 1 | Note 1 | -     |
| Functional Test: Go-no-Go VOL 1V8              | Note 1          | Note 1 | Note 1 | -     |
| Functional Test: Go-no-Go JTAG                 | Note 1          | Note 1 | Note 1 | -     |
| Functional Test: Go-no-Go BS_scan              | Note 1          | Note 1 | Note 1 | -     |
| Functional Test: Go-no-Go IO tests             | Note 1          | Note 1 | Note 1 | -     |
| Functional Test: Go-no-Go Dalhia ATPG          | Note 1          | Note 1 | Note 1 | -     |
| Functional Test: Go-no-Go Dalhia MemBist       | Note 1          | Note 1 | Note 1 | -     |
| Functional Test: Go-no-Go Dalhia PIIbist       | Note 1          | Note 1 | Note 1 | -     |
| Functional Test: Go-no-Go Fabric Config        | Note 1          | Note 1 | Note 1 | -     |
| Functional Test: Go-no-Go Fabric Tiles         | Note 1          | Note 1 | Note 1 | -     |
| Functional Test: Go-no-Go Fabric Interconnect  | Note 1          | Note 1 | Note 1 | -     |
| Functional Test: Go-no-Go Fabric Membist       | Note 1          | Note 1 | Note 1 | -     |
| Functional Test: Go-no-Go Fabric ATPG          | Note 1          | Note 1 | Note 1 | -     |
| Functional Test: Go-no-Go Fabric PIIbist       | Note 1          | Note 1 | Note 1 | -     |
| Functional Test: Go-no-Go Fabric IOBank        | Note 1          | Note 1 | Note 1 | -     |

## 2.4.2 High and Low Temperatures Electrical Measurements

The characteristics, test methods, conditions and limits shall be the same as specified in Para. 2.4.1 except where shown below.

| Characteristics                           | Test Conditions                                                | Limits |     | Units |
|-------------------------------------------|----------------------------------------------------------------|--------|-----|-------|
|                                           |                                                                | Min    | Max |       |
| IDD_stat_reset_consumption<br>VDDCORE_1V0 | T <sub>j</sub> = +125 (+0 -5)°C<br>and -40 (+5 -0)°C<br>Note 1 | -      | 20  | A     |

## 2.4.3 Notes to Electrical Measurements at Room, High and Low Temperatures

1. The specific test conditions and requirements are detailed in the Manufacturer's PID.

## 2.5 PARAMETER DRIFT VALUES

Unless otherwise specified, the measurements shall be performed at T<sub>amb</sub> = +22 ±3 °C.

The test methods and test conditions shall be as per the corresponding test defined in Para. 2.4.1, Room Temperature Electrical Measurements.

The drift values (Δ) shall not be exceeded for each characteristic specified. The corresponding absolute limit values for each characteristic shall not be exceeded.

| Characteristics                                | Limits              |          |     | Units |
|------------------------------------------------|---------------------|----------|-----|-------|
|                                                | Drift<br>Value<br>Δ | Absolute |     |       |
|                                                |                     | Min      | Max |       |
| Leakage IIL                                    | ±2                  | -5       | 5   | μA    |
| Leakage IIH 1V8                                | ±2                  | -5       | 5   | μA    |
| Leakage IIH 3V3                                | ±2                  | -5       | 5   | μA    |
| Leakage IIL Soc (dahlia)                       | ±2                  | -5       | 5   | μA    |
| Leakage IIH 1V8 Soc (dahlia)                   | ±2                  | -5       | 5   | μA    |
| Leakage IIH 3V3 Soc (dahlia)                   | ±2                  | -5       | 5   | μA    |
| IDD_stat_reset_consumption<br>VDDCORE_1V0      | ±0.4                | -        | 2   | A     |
| IDD_stat_reset_consumption<br>SOC_VDDCORE_1V0  | ±0.04               | -        | 0.8 | A     |
| IDD_stat_reset_consumption<br>HSSL_D_VDD_1V0   | ±0.04               | -        | 0.8 | A     |
| IDD_stat_reset_consumption<br>IOB_VDDIO_1V8    | ±0.04               | -        | 0.8 | A     |
| IDD_stat_reset_consumption<br>SOC_DDR_VDDIO1V8 | ±0.04               | -        | 0.8 | A     |
| IDD_stat_reset_consumption<br>IOB_VDDS_1V8     | ±0.04               | -        | 0.8 | A     |
| IDD_stat_reset_consumption<br>SOC_DDR_VDDS_1V8 | ±0.04               | -        | 0.8 | A     |
| IDD_stat_reset_consumption<br>SOC_DDR_VTO_0V9  | ±0.04               | -        | 0.8 | A     |
| IDD_stat_reset_consumption<br>IOB_VTO_0V9      | ±0.04               | -        | 0.8 | A     |
| IDD_stat_reset_consumption                     | ±0.04               | -        | 0.8 | A     |

| Characteristics                                | Limits                     |          |     | Units |
|------------------------------------------------|----------------------------|----------|-----|-------|
|                                                | Drift<br>Value<br>$\Delta$ | Absolute |     |       |
|                                                |                            | Min      | Max |       |
| CKG_PLL_VDD1V8A                                |                            |          |     |       |
| IDD_stat_reset_consumption<br>HSSL_VDD1V8A     | ±0.04                      | -        | 0.8 | A     |
| IDD_stat_reset_consumption<br>SOC_PLL_VDD1V8   | ±0.04                      | -        | 0.8 | A     |
| IDD_stat_reset_consumption<br>VDD1V8A          | ±0.04                      | -        | 0.8 | A     |
| IDD_stat_reset_consumption<br>CKG_PLL_VDDA_1V0 | ±0.04                      | -        | 0.8 | A     |
| IDD_stat_reset_consumption<br>HSSL_VDDA_1V0    | ±0.04                      | -        | 0.8 | A     |
| IDD_stat_reset_consumption<br>SOC_PLL_VDDA_1V0 | ±0.04                      | -        | 0.8 | A     |
| IDD_stat_reset_consumption<br>SBSCAN_VDDIO_3V3 | ±0.04                      | -        | 0.8 | A     |
| IDD_stat_reset_consumption<br>IOB_VDDIO_3V3    | ±0.04                      | -        | 0.8 | A     |
| IDD_stat_reset_consumption<br>VDDIO_SERVICE3V3 | ±0.04                      | -        | 0.8 | A     |

## 2.6 INTERMEDIATE AND END-POINT ELECTRICAL MEASUREMENTS

The characteristics, test methods, conditions and limits shall be the same as specified in Para. 2.4.1, Room Temperature Electrical Measurements and Para. 2.4.2, High and Low Temperatures Electrical Measurements.

## 2.7 POWER BURN-IN CONDITIONS

| Characteristics            | Test Conditions (Notes 1, 2) | Units |
|----------------------------|------------------------------|-------|
| Test Temperature ( $T_j$ ) | +125 (+0 -5)                 | °C    |
| Voltage: VDDCORE           | 1.2                          | V     |

### NOTES:

- During Power Burn-in, the component is configured and then stimuli are applied.
- Test set-up details shall be as specified in the Manufacturer's PID.

## 2.8 OPERATING LIFE CONDITIONS

Unless otherwise specified the conditions shall be as specified in Para. 2.7, Power Burn-in Conditions.

| Characteristics            | Test Conditions (Notes 1, 2) | Units |
|----------------------------|------------------------------|-------|
| Test Temperature ( $T_j$ ) | +125 (+0 -5)                 | °C    |
| Voltage: VDDCORE           | 1.23                         | V     |

### NOTES:

- During Operating Life, the component is configured and then stimuli are applied.
- Test set-up details shall be as specified in the Manufacturer's PID.

## 2.9 TOTAL DOSE RADIATION TESTING

### 2.9.1 Bias Conditions and Total Dose Level for Total Dose Radiation Testing

Continuous bias shall be applied during irradiation testing as specified below.

The total dose level applied shall be as specified in Para. 1.4.2 or in the Purchase Order. The Radiation Dose Rate shall be within Window 2, i.e. 36 to 360 rad(Si)/hour.

| Characteristics                                                                      | Test Conditions | Units |
|--------------------------------------------------------------------------------------|-----------------|-------|
| Ambient Temperature                                                                  | +20 ±2          | °C    |
| Fabric Core Voltage<br>All power supplies requiring 1V voltage except<br>SOC_VDDCORE | 1 ±0.014        | V     |
| SoC Core Voltage: SOC_VDDCORE                                                        | 1 ±0.004        | V     |
| All power supplies requiring 1.8V<br>Used Complex Bank VDDIO: VDD1V8                 | 1.8 ±0.008      | V     |
| All power supplies requiring 3.3V<br>Used Direct Bank VDDIO: VDD3V3                  | 3.3 ±0.010      | V     |
| Unused I/O                                                                           | Not connected   |       |
| Unused Supplies                                                                      | 0               | V     |
| Negative Supply Voltage: VSS                                                         | 0               | V     |

#### **NOTES:**

1. Annealing shall be performed with the static bias conditions for a duration of 89 hours at a chamber temperature of +20°C followed by 168 hours minimum at a chamber temperature of +100°C.
2. Test set-up details shall be as specified in the Manufacturer's PID.

### 2.9.2 Electrical Measurements for Total Dose Radiation Testing

Prior to irradiation testing the devices shall have successfully met Room Temperature Electrical Measurements specified in Para. 2.4.1.

The measurements shall be performed at room temperature.

The test methods and test conditions shall be as per the corresponding test defined in Para. 2.4.1, Room Temperature Electrical Measurements.

## **APPENDIX A**

### **AGREED DEVIATIONS FOR STMICROELECTRONICS (F)**

| ITEMS AFFECTED                                                                                                                                                                               | DESCRIPTION OF DEVIATIONS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Para. 2.1.1 Deviations from the Generic Specification:<br>Deviations from Qualification, Periodic Testing and Lot Validation Testing for Flip-Chip Integrated Circuit Components – Chart F4B | Operating Life:<br><ul style="list-style-type: none"> <li>Data Points: Intermediate and End-Point Electrical Measurements may be performed up to 96 hours after completion of Operating Life.</li> </ul>                                                                                                                                                                                                                                                                                                    |
| Para. 2.1.1.3 Deviations from Screening Tests – Chart F3<br><br>Para. 2.7 Power Burn-in Conditions                                                                                           | Power Burn-in:<br><ul style="list-style-type: none"> <li>Duration: shall be 24 hours minimum.</li> <li>Data Points: measurements of Parameter Drift Values may be performed up to 96 hours after completion of Power Burn-In.</li> </ul>                                                                                                                                                                                                                                                                    |
| Para. 2.1.1.3 Deviations from Screening Tests – Chart F3                                                                                                                                     | Check for Lot Failure:<br>Check for Lot Failure shall only take into account electrical parameter failures that occur during Chart F3 subsequent to Power Burn-in, in accordance with Parameter Drift Values (Final Measurements) (Para. 8.14.1) and Room Temperature Electrical Measurements (Para. 8.14.2).<br><br>If the number of these failed components exceeds 5% (rounded upwards to the nearest whole number) of the components submitted to Power Burn-in, the lot shall be considered as failed. |

### **ADDITIONAL DATA - STMICROELECTRONICS (F)**

(a) Recommended Application Information

All information regarding the usage of the NG-ULTRA, such as the recommended On/Off Power Sequences, may be found on the NanoXplore website:

- <https://nanoxplore.com>
- <https://nanoxplore-wiki.atlassian.net/wiki/spaces/NAN/pages/9961482/NG-ULTRA>